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THESIS

LOGISTICS PLANNING FOR DEPLOYMENT: A COMPARATIVE STUDY OF THE ROYAL NORWEGIAN AIR FORCE AND THE UNITED STATES AIR FORCE

by

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13. ABSTRACT

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Logistics relationships, assets and planning tools that influence logistics efficiencies in the two air forces are identified and analyzed. By comparing the planning process in the two organizations, important factors in the planning, deployment and sustainment phases are identified. These factors help determine how logistics efficiencies can contribute to operational effectiveness.

With declining spending on defense, air forces need to improve logistics efficiency in order to maintain the required level of operational effectiveness. An air force needs to develop the right mixture of logistics investment in structure and assets versus efficient logistics processes. In order to achieve the right mixture of logistics, knowledge of the interrelated logistical and operational factors is required, and trade offs have to be made.

The thesis recommends that further research be undertaken to determine the appropriate factors that contribute to efficient logistics in support of deployments.

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LOGISTICAL PLANNING FOR DEPLOYMENT: A COMPARATIVE STUDY OF THE ROYAL NORWEGIAN AIR FORCE AND THE UNITED STATES AIR FORCE

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I. INTRODUCTION

A. BACKGROUND

> Logistics provides the physical means for organized forces to exercise power. In military terms, it is the creation and sustained support of combat forces and weapons. Its objective is maximum sustained combat effectiveness. (Eccles, 1959)

The war fighters of the 21st century are expected to be mobile, flexible and responsive to a whole specter of military operations. The scenario of where the next conflict will take place is uncertain compared to the situation NATO had during the Cold War. The new situation means that forces have to maintain and execute the capability to deploy to areas where their services are urgently requested. In order to conduct deployments successfully, logistics support has to be organized and ready.

The deployment of squadrons for operation abroad is a new challenge to the Royal Norwegian Air Force (RNoAF). Few studies have been written in Norway about logistical requirements for squadrons that are expected to deploy for operations abroad. Logistics will be an important factor in the planning and execution of deployment operations. This thesis gives planners in the RNoAF new insight into how logistics is organized and prepared in another air force.

In addition, this thesis aims to identify and analyze the complexity of logistical aspects in the planning, deploying, and sustaining phases of a deployment. It, further, discusses the balance of effective[1] and efficient logistics support. A comparative study of

[1] Effectiveness and efficiencies will be described and discussed in Chapter II

how the planning and execution of those tasks are organized in two different air forces, the United States Air Force (USAF) and the RNoAF, may lend answers that can be incorporated into future RNoAF logistics system and doctrine.

B. PURPOSE

The comparison of these two organizational structures provides logistical and operational planners of each air force with new insight in logistical planning. The RNoAF has encountered several challenges in adapting a new concept, where deployment for international operations is one of the main missions. This thesis will give recommendations on how to organize and plan for logistics for future operations.

C. SCOPE

This thesis provides background and discusses logistics' role in deployments of the USAF and the RNoAF. Major logistical areas important for successfully planning, deploying, and sustaining a squadron are identified.

The requirements an air force encounters while planning, deploying and sustaining a squadron for operations will be conducted by comparing the RNoAF concept for Immediate Reaction Forces (IRF) and the United States Air Force Expeditionary Air Force. This thesis discusses the two concepts and compares advantages and disadvantages for both concepts.

D. METHODOLOGY

This thesis focuses on the logistical requirements a squadron encounters when deploying abroad. The analysis is based on literature research from books, theses, journal articles and RAND studies, Norwegian Government White Papers and Norwegian Armed Forces logistical directives and plans. Interviews of personnel involved in logistical planning in both the USAF and the RNoAF have also been conducted.

E. ORGANIZATION

In Chapter II, a brief background on logistics' role in deployment operations is given. Further, Chapter II discusses the background and changes that have taken place in the RNoAF and the USAF operational and logistical concepts. Chapter III discusses the logistical challenges the two air forces are encountering and how they are met. Chapter IV analyses the two concept and how operational effectiveness can be met by improving logistical efficiency. Chapter V provides, conclusion, recommendations and topics for further studies.

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II. OPERATIONAL AND LOGISTICS CONCEPTS

A. BACKGROUND

A deployment of military forces to a foreign territory requires operational and logistical forces. A logistical force contributes to aircraft availability[2] and supports the endurance of an operation, which are both a result of the quality of the logistical and operational planning. When deployed, the force has to use its own resources or established systems so that logistical needs can be satisfied. This support could be obtained by bringing logistics with the deploying squadron or establish a responsive logistical system. Or more importantly the optimal combination of each. In other words the effectiveness of the war fighters is directly dependent on logistics efficiency.

A typical deployment starts with a planning phase in which forces are prepared according to given directives. The actual deployment starts when the plans are carried out and the forces are moved either by sea, air or land to the deployment area. The next task is establishing the forces in the area where operations are to be based. How well the forces logistically perform in the new environment depends on the planning done before the deployment. Both the United States Air Force (USAF) and the Royal Norwegian Air Force (RNoAF) use some type of planning approach to be self-sustained for a defined[3] period before establishing supply lines.

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[2] In both the USAF and the RNoAF aircraft availability is measured in Fully Mission Capable Aircraft (FMC)

[3] The USAF and the RNoAF use a decided number of days of operation as a planning guidance

The deploying unit brings its own logistics[4] elements, which consist of personnel, War Readiness Material (WRM), repair and maintenance equipment, and different services, for example exchange, dining and lodging facilities. The required logistics sent with the deploying units differ depending on several factors, including type of mission, length of deployment and the host nation support agreement (HNS). RAND (Tripp, 1999) has developed an employment-driven combat-support-requirements model (Figure 1) that is helpful in identifying requirements for a deployment. The model shows all factors and requirements that have to be considered and balanced in the logistical and operational planning process.

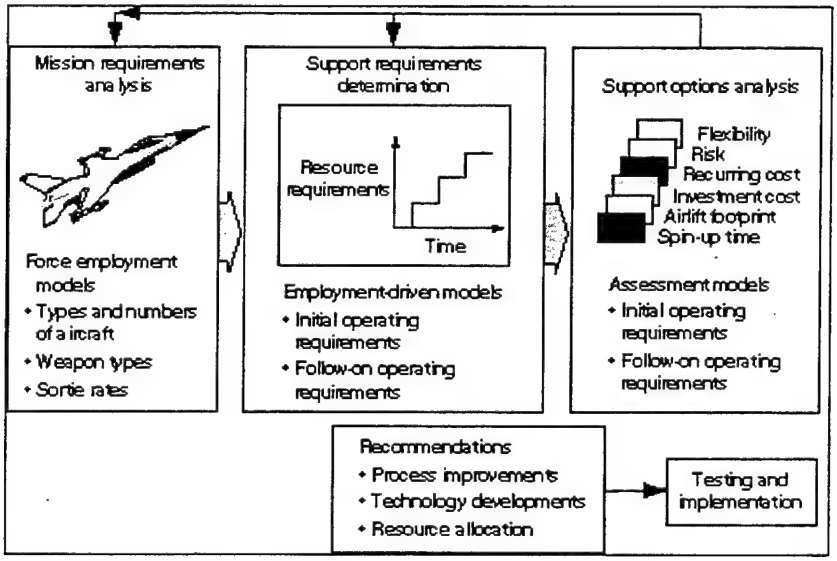

Figure 1. Employment-Driven Analytical Framework (From: RAND MR-1056-AF)

[4] Definition of logistics given in Appendix A

Mission requirements, such as number of aircraft, type of missions and sortie rates have to be balanced with a feasible and available logistical support solution. Operational requirements have an effect on the logistics support concepts and vice versa. The challenge is to maximize the operational effectiveness with maximum logistics efficiency.

B. LOGISTICAL CHALLENGES DURING DEPLOYMENTS

It is difficult, if not impossible, to take into account all factors that can come into play during military operations. A statement by Admiral Hyman Rickovers, US Navy, best illustrated the challenge:

> To inquire if and where we made mistakes is not to apologize. War is replete with mistakes because it is full of improvisations. In war we are always doing something for the first time. It would be a miracle if what we improvised under the stress of war should be perfect.

If what Clausewitz (1984: p. 121) describes as "fog and friction" that is "...the force that makes the apparently easy so difficult" is added to the complexity of military operations, "the force" could, for example, affect the human factor that is meant to work under difficult conditions: rugged terrain, geographically difficult areas and demanding physical conditions, little to no available information, complex command and control systems, and lack of supplies and maintenance of equipment. As a result planning must clearly be done to meet and solve the "fog and friction" situations during operations.

"Fog" is what Clasewitz (1984) labels uncertainty:

> ...which constitutes one of the most serious sources of friction in war, by making things appear entirely different from what one had expected.

The enemy will not always do what is expected of him. The information that is available can be misleading or completely wrong; nevertheless, operations have to be carried out. "Fog and friction" increases the need for thorough planning before a deployment of military forces.

The final operational and logistical plans should include enough flexibility so that unexpected occurrences can be met. General William "Gus" Pagonis , commander of the logistics forces during the Gulf War (Pagonis, 1992), emphasized that all plans made during the Gulf War by the coalition force had enough flexibility for them to deal with "fog and friction." Carter B Magruder (1991), describes in his book, *Recurring Logistic Problems As I Have Observed Them,* how logistical problems arise again and again during military operations. Historical experiences both in the USAF (Magruder,1991) (Pagonis,1992) and the RNoAF (Ramberg,1997) have shown that it is impossible to plan for all circumstances that might arise during a deployment. There has to be a balance between a brief framework and a detailed plan that aims to cover all aspects of a deployment. It is important that personnel has the opportunity to use its initiative and knowledge to solve new and unique problems (Rekkedal, 1996: pp 80-83).

The goal for the logistics organization during a deployment is to maximize its support for the overall mission and the war fighters with the most efficient use of

resources. Saying this, it also makes sense that deploying wings or squadrons learn strategies to avoid mistakes that the organization experienced on previous deployments.

1. The Role of Logistics During Military Operations

Logistics support has proven to be critical for the overall mission when military forces have deployed to areas outside their own bases. If logistics support and services do not work properly, it affects any chance of completing the mission by efficient and suitable means. This belief is also illustrated in a statement by General Dwight D. Eisenhower, USA (Joint Pub 4-0:2000):

> You will not find it difficult to prove that battles, campaigns, and even wars have been won or lost primarily because of logistics.

Several historical examples support Eisenhower's statement. One example from the Second World War illustrates the effect of operational and logistical relationship (Air Force Manual 1-1, 1992). A squadron of 12 B-17 aircraft was deployed from the continental United States (CONUS) via the Atlantic, Africa and India to Java to meet the Japanese offensive. The aircrafts were loaded with crew members, but not with a logistics element. These aircrafts were more or less operational for two weeks before withdrawing from the war zone due to need of maintenance and supplies. This example illustrates the mobility of air forces, but also its limitation.

> An overall deployment plan must include operational and support forces that are responsive to the unified command, sufficient for the anticipated duration and types of operations, and suited to the conditions they are expected to encounter. Deployment and employment plans must also have ample flexibility to accommodate the unforeseen needs that only operations can identify. (Liddle Hart, 1974: pp 329-331)

2. The End of the Cold War

During the Cold War, Norwegian forces, in contrast to the US forces, were expected to operate out of their own home bases or preplanned bases in Norway. This lead to the development of a stationary logistical organization focused around the existing infrastructure.

After the end of the Cold War, the Norwegian Armed Forces began a transformation making it suitable for operations abroad. Restructuring is presently taking place, and important decisions about the future defense structure are expected to be made by the Norwegian Government in the spring of 2001. However, Norway has been exposed to the challenge of deployment of forces in operations abroad. Army and RNoAF units were deployed to the former Yugoslavia in 1993 as part of the UN-lead mission. In 1998 fighter aircraft were deployed to Italy as part of the NATO-lead operation "Allied Force" in Kosovo. There is a move towards more operations abroad and less emphasis on the defense of the Norwegian territory, among both the political and military leadership (White Paper 38, 1999) and (Defence Study 2000, 2000).

The RNoAF is expected to contribute several forces to future operations abroad, among them is a fighter squadron: 338th squadron from Ørland Air Force Base (AFB). Logistics is an important part of the preparation that has to take place in order to make

this squadron ready for operations. This dedicated squadron has been preparing for future deployments through participating in several exercises and operations. For example as part of Allied Force during the war in Kosovo, four F-16s with logistics support elements were deployed to Italy. Today, logistical concepts for the RNoAF are still under development and lessons have been learned since planning started in 1991[5]. Nevertheless, areas still need to be improved and changes to continue. A deploying squadron encounters new challenges at each deployment such as:

- What type of mission and sortie requirements?
- In which area will the squadron be deployed?
- What facilities and infrastructure are available?
- What logistics support should be brought into the area of operation?
- What is available as Host Nation Support (HNS)?

The challenge of logistical planning is illustrated in a statement made in the US Armed Forces Joint Logistics Doctrine (Joint Publication 4-0, 1992):

> Seldom will all logistics principles exert equal influence: usually one or two will dominate in any given situation. Identifying those principles that have priority in a specific situation is essential to establishing effective support.

The requirements and challenges that the RNoAF encounters in logistical planning for its future operations should be similar to what the USAF encounters in its

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[5] Parliamentary resolution of 1991 that the 338th squadron at Ørland Air Force

planning for operations abroad. This thesis compares the two systems illustrating how challenges are met, and possible solutions for future logistical planning.

C. TRANSFORMATION OF THE RNOAF

1. The Norwegian Armed Forces in the Past

During the Cold War the RNoAF encountered numerous logistical and operational challenges. Since, Norway was strategically located in the northern region next to the former Soviet Union, NATO identified this northern area as one of those where a war between East and West was highly probable. Due to this the RNoAF was given priority in the operational and logistical planning that took place in NATO. Several contingency plans were developed that would direct forces from NATO countries to Norway if a tense situation should arise. In order for Norway to host allied forces dedicated for deployment; it had to develop its infrastructure and logistics capacity to support allied operations from Norwegian territory.

The mission that shaped the RNoAF during the Cold War was the protection of one region of the country. Because of this the air force was centered around the ability to deploy the greatest possible force to defend Norwegian territory in the event of a large-scale attack against North Norway. An attack of this kind would require a buildup of logistics and forces by the aggressor in the East where it could be detected, and provided strategic warning. This would make it possible for Norway to conduct mobilization and

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Base, should be the Norwegian contribution to NATO's IRF fleet of combat aircraft .

host allied forces deployed to Norway as part of an NATO Article 5[6] operation. The RNoAF's principal tasks during the Cold War was to patrol, control and give warning in air space above Norwegian territory and adjacent maritime areas, and to conduct air operations against invasion forces (The Royal Norwegian Ministry of Defence, 2001: pp. 32-37).

2. The New Strategic Concept in NATO Takes Shape

During the Cold War, contribution of the Norwegian Armed Forces to the defense of the NATO alliance was the defense and surveillance of Norway and, especially, its northern region towards former Soviet Union. The plan was not to deploy abroad, but to defend the Norwegian territory against an aggressor from the East until the alliance deployed to Norway.

At a NATO meeting in London in July 1990, NATO's Heads of States and Governments agreed on the need to transform the Atlantic Alliance to reflect the new, more promising, era in Europe. The conclusion of the meeting, which was later agreed upon by the Heads of State and Government participating in the meeting of the North Atlantic Council in Rome through November 7th - 8th, read (NATO Defense Planning Committee, 1991):

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[6] Article 5 of the North Atlantic Treaty deals primarily with deterrence against the use of force against members of the Alliance and embodies the principle that an attack against any one of them is considered as an attack against all. Alliance activities falling outside the scope of Article 5 are referred to collectively as "Non-Article 5 Operations"

> NATO's strategy will retain the flexibility to reflect further developments in the politico-military environment, including progress in the moves towards a European security identity, and in any changes in the risks to Alliance security. For the Allies concerned, the Strategic Concept will form the basis for the further development of the Alliance's defence policy, its operational concepts, its conventional and nuclear force posture and its collective defence planning arrangements.

The new force structures that reflected the characteristics of flexibility, mobility and multinationality identified in the London Declaration took form when three main categories of forces were established: Reaction Forces, Main Defense Forces and Augmentation Forces. These forces met the new security challenges in NATO's area of responsibility. The new structures would give NATO flexibility and responsiveness to react on the full spectrum of military operations. The Reaction Forces were divided into two categories, which were Immediate Reaction Forces (IRF) and Rapid Reaction Forces (RRF). A decision was made that the Norwegian Armed forces would dedicate sea, air and land forces to the new concept (White Paper No. 46, 1994). Among the forces that the Royal Norwegian Air Force would equip and train for future operations was a Reaction Force in the category of Immediate Reaction Force (IRF). This squadron consisting of 12 F-16s with a support organization would be able to deploy from its home base within five days of notification.

The post Cold War area marked a change in NATO's wartime planning. The focus changed more towards Non-Article 5 operations like the engagement of NATO in former Yugoslavia. Non Article 5 operations are operations that take place outside the defined territory of NATO (NATO Washington Summit, 1999).These low intensity and regional conflicts are the most likely scenarios for NATO to encounter in the next decades.

By adapting the new strategic concept, NATO declared its willingness to also accept mandates from international organizations (for example the United Nations, Organization for Security and Cooperation in Europe, and Western Europe Union) to carry out Peace Support Operations (PSO) outside the Alliance territory. The term PSO reflects a broad spectrum, from humanitarian missions up to peace enforcement operations. Most importantly, these types of operations can even involve the participation of non-NATO armed forces. A recent example is the conflict in the Balkans. There is consensus among NATO nations that PSOs (Non-Article 5) are the types of operations most likely to happen. The member nations are expected to contribute equipped and trained forces with necessary logistics support for similar operations in the future.

3. Response to the New Challenge

An overarching aim of Norwegian security policy during the Cold War was to safeguard its national interests within the framework of the various international cooperation processes (The Royal Norwegian Ministry of Defense, 2001). A broad consensus of the fundamental objectives for Norwegian security policy remains as follows:

- to prevent war and contribute to stability and peaceful development;
- to protect Norway's freedom of action against political and military pressure and to safeguard Norwegian rights and interests in the sphere of international cooperation;
- to preserve Norwegian sovereignty.

Those goals were the same during the Cold War and have remained the same in the present process to reshape the RNoAF for future operations. Norwegian defense policy has been based on four mutually reinforcing principles:

- a balanced national defense
- cooperation with allies and participation in international operations
- total defense concept
- universal military service

One of the main topics in the Norwegian Defense Study 2000 (Defense Study 2000, 2000) is maintaining a balanced military in the future. According to this study it is necessary to build forces that are both able to contribute to the defense of Norway as well as to international operations. Future logistical organization and planning is important in order to achieve the operational requirements and vice versa.

Participation in international operations is important for all three services. The Norwegian Government has placed a maximum number of 3500 personnel from all services that are deployable at the same time. Since Norway will never be the single nation that contributes to an international operation and due to its size, the RNoAF will always need to cooperate with other nations to achieve an efficient deployment.

Norway has a conscription force in which airmen serve from six to twelve months. The new RNoAF consists of approximately 8500 people and 48 fighter aircraft divided among eight bases during peacetime operations. Since Norway has a mobilization force, it is possible to mobilize 33,000 people for the RNoAF. However, it is not possible to mobilize for operations abroad. Personnel involved in a deployment are volunteers

within the Air Force or mobilization force. However, changes in military policy may necessitated officers to be ordered for deployment.

4. The Defense Policy for the Future

Defense policy forms the central plank of the Government's security policy and the Norwegian Armed Forces represents the principal instrument of this policy. The tasks of the Armed Forces can be grouped under nine main headings (The Royal Norwegian Ministry of Defence, 2001):

- anti-invasion defense
- territorial defense
- crisis management
- preservation of sovereignty and exercise of authority
- intelligence service
- security service
- participation in international operations
- search and rescue service
- support to the civil community.

These functions have provided guidelines for the development of Norway's Armed Forces. In its development policy makers have emphasized the importance of creating a force that is not only able to participate in anti-invasion, but also international operations (Defense Study 2000, 2000).

5. The Road Ahead

Future conflicts in the immediate area around the Norwegian border are expected to be more limited with regard to both the forces involved and the geographic area. This is a direct result of a possible conflict in Norway that would no longer be an outlying aspect of a major East-West war in Europe, but would be a regional issue - resources, security, or some other matter. Additionally, a crisis could escalate from a purely political confrontation to an armed conflict much faster than in the past (Defense Study, 2000). This makes it of far greater importance than up to this time to be able to quickly reinforce the standing military presence on the Norwegian side without having to go through a time-consuming mobilization of the kind Norway was dependent on during the Cold War.

As a result, the underlying structural priorities of the armed forces have changed, with responsive and deployable capability becoming more important than volume (Godal, 2001). To achieve the required readiness, logistics has to be properly planned and organized to ensure efficient use of forces.

The Ministry of Defense issued a White Paper No. 14 in 1992 (White Paper No 14, 1992) and followed up with a new White Paper No. 46 (1993), stating that the armed forces are expected to contribute forces for operation abroad as part of NATO, UN or other international organizations. These requirements have increased as time has passed (White paper No. 22, (1997-98)), and White Paper No. 38 (1998-99). The Defense study 2000 is, also, based on the assumptions that the RNoAF and the other services are expected to contribute forces for operations abroad. One of the main system components

the RNoAF decided to design and equip for international operation is the F-16 squadron located at Ørland AFB. This squadron is part of the new NATO's Immediate Reaction Force Concept (IRF), a quick and responsive air force that could be deployed into operation within NATO's area of responsibility (AOR).

6. The Solution

The main premise of the RNoAF has been an air force trained and equipped for air defense of Norway. The Norwegian defense concept is built around the NATO concept of operations where the RNoAF operates over Norwegian territory to secure landing of allied forces. Until 1993 the RNoAF primarily trained and equipped its forces for a full-scale war, positioning its forces in different bases around Norway. In 1993 Norway participated in the UN-lead operation in former Yugoslavia with one helicopter wing. During this operation it became apparent that logistics planning had been neglected for decades and that the RNoAF logistics concept was not designed for international operations (Ramberg, 1997). As part of the new security situation in Europe, NATO requested Norway to design forces to fit the IRF concept.

7. The Defense of Norway and International Operation

During the Cold War the RNoAF squadrons practiced small scale deployments in Norway and to bases abroad with limited logistics support. This challenge for the IRF was that few officers had experience in this sort of deployment. At the same time NATO reorganized its concept of operations, initiatives from the RNoAF Air Staff were

implemented to reorganizing the RNoAF concept. This project, named "Phoenix", was built on the concept that the whole Air Force should be more mobile and deployable. From 1991 to present, the RNoAF has been working on the concept to make the IRF squadron a deployable and sustainable part of a NATO operation. The goal is to take advantage of the experiences gained in the IRF concept and make them applicable to the development of the new air force organization and structure. The IRF concept has huge logistical implications for an organization prepared to operate only out of existing domestic bases and infrastructure.

D. TRANSFORMATION OF THE USAF

When General Ryan announced the new Expeditionary Air Force (EAF) concept he described the situation the USAF was encountering with the following words (Ryan, 98):

> In response to the changing international and geopolitical environment, the United States Air Force has embarked on the most significant reorganization of its forces in the post-Cold War era. The fundamental change for the future is that instead of maintaining the USAF forces in a forward-deployed location, it is a move to keep the units within the continental United States and prepare them so that they are ready for rapid worldwide deployment.

General Ryan's statement is supported in the America's Air Force Vision 2020. The new USAF is expected to be agile, lean and lethal in the future (America's Air Force Vision 2020, 2000).

The USAF has, since its founding in 1947, been heavily represented overseas at forward operated bases both in Europe and the rest of the world. In the past, US air power has been applied almost exclusively outside the CONUS. The US has been able to export forces and the necessary logistics to locations overseas.

Unlike the RNoAF the USAF has always been preparing for deployment out of the continental United States (CONUS) to bases overseas. This has been one of the cornerstones of the defense concept that was developed during the Cold War. To make deployment more effective, forces were stationed forward, and strengthened by deploying forces and necessary logistics.

The USAF invested heavily in base infrastructure and logistics at bases they planned to use in the event of a war. The experiences from Operation Desert Storm and the end of the Cold War changed most of the planning assumption that had been guiding planning during the 70-80's. Budget cuts and reduction of forces also forced a change of how the USAF would meet future conflicts.

The destruction of the Berlin Wall in 1989 marked the end of a bipolar world where two superpowers were confronting each other in a world where the United States was the only superpower in a world of many regional powers (Tripp, 1999: pp 2-4). This new world situation has mandated interventions of US forces in a whole spectrum of military operations, from humanitarian relief to a full scale war like the Gulf War, the USAF has been involved in most of the operations. The number and frequency of these deployments have created ongoing problems for the USAF. Because of force reduction during the latter half of the 1990s, deployments are carried out by substantially smaller forces than those in the 1980s and even during Operation Desert Storm (Tripp, 1999: pp

2-4). The new situation has increased the workload for personnel, especially the specialists in critical fields who were sent on frequent and long deployments. This has increased the workload on both the deployed personnel and the people left behind who must perform the duties of those deployed. The decreased retention, coupled with recent declining defense expenditure, has contributed to recent troubling decreases in overall readiness (Peters, F. Whitten, 1999).

In the end of the 1990s, the USAF was caught in a situation requiring a change in strategy to solve future deployments in which the USAF was called upon. In August 1998, the Chief of Staff Air Force (CSAF) held a press conference announcing that the USAF was adopting the EAF concept as its basis for responding to small-scale contingencies. The CSAF emphasized that there were many details still to be decided, and the EAF concept would be the key part of the Air Force's response to the new environment (Ryan, 1998). The new concept also involved logistical challenges that were unique to the way the USAF had been operating up to that point (Tripp, 1999).

1. The Expeditionary Air Force (EAF)

The Chief of Staff Air Force (CSAF) announced that the Expeditionary Aerospace Force would be divided into ten Aerospace Expeditionary Forces (AEFs), each composed of a mixture of fighters, bombers and tankers (Ryan, 1998).

The concept was that two of the AEFs should supply forces for permanent rotations and be on-call during a 90-day period. The forces that would be called upon would be tailored in size and/or capability for the specific mission. The period on alert would be followed by a 12-month period during which the units would not be available

for short-notice deployment rotations. This schedule would create more predictability in planning unit activities, such as training and maintenance. The reduction of instability about sudden deployment would also improve the quality of life for personnel. The conceptual planning cycle for the EAF concept is as follows:

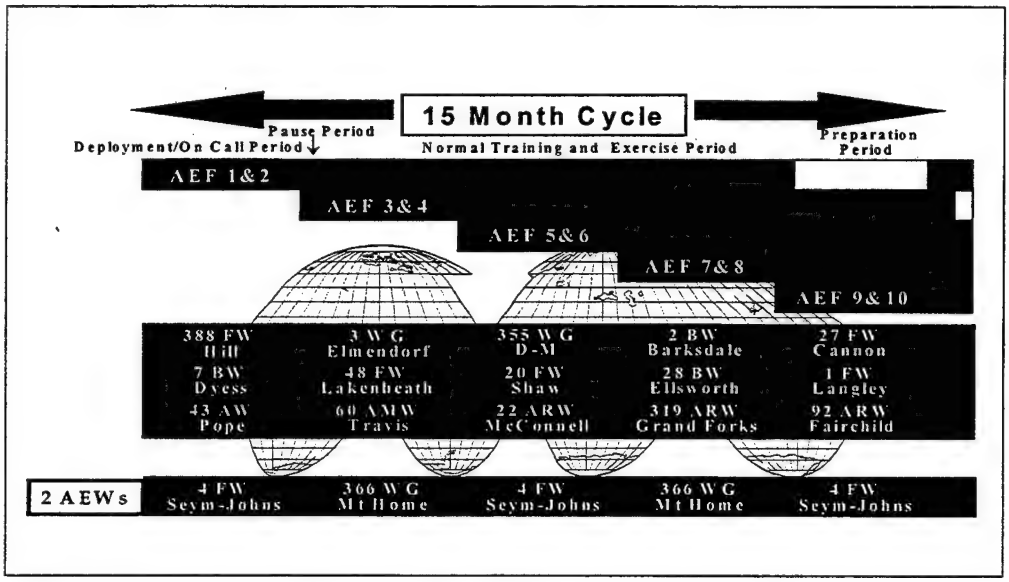

Figure 2. EAF Planning Cycle
(From: Newsletter EAF Implementation, Outreach Branch,
HQ AF/XOPE. Pentagon 26th May 1999)

The EAF is organized, trained and equipped to deploy and sustain itself in a global security environment. The ten AEFs have been put together from various units in the USAF representing different air power missions. Two of these AEFs are "on call" at any given time for immediate deployment. Formerly units were tasked as needed on an ad hoc basis in a more reactive mode and pieced together as a fighting unit after arrival in theater. In the future these units will have a set schedule as shown in Figure 2 and will train together and fight together. During the Cold War the USAF had far more aircraft and personnel forward based in Europe, Asia and other locations (Tripp, 1999). These

personnel was ready for any conflict and formed the forward deployed expeditionary forces. Today, the USAF has fewer overseas bases, and less personnel and aircraft forward deployed. The CSAF announced in his press announcement that a change was necessary to meet the future challenge.

III. LOGISTICAL PLANNING FOR DEPLOYMENT – EMERGING CONCEPTS

A. INTRODUCTION

This chapter focuses on how the two air forces have planned for logistical efficiency. Chapter II pointed out the process that the USAF and the RNoAF have and are still undergoing adjustment to the operational and logistics concept of the future. In this chapter the planning process, logistical organization and the tools available to assist in the planning for deployment are discussed. How is the logistical planning process organized in the USAF as compared to the RNoAF? How is the deploying wing or squadron involved in the planning process? What tools are available for the logistical planners? In this chapter these questions are answered while in Chapter IV the two concepts are analyzed.

1. Assumptions

For the scope of this thesis it is not feasible to analyze the logistical planning that takes places on all the different command echelons in the USAF; therefore the thesis analyzes and compares the logistical planning that takes place at the wing/squadron level.

2. What Drives Logistical Planning?

Allied Logistics Publication (ALP-13,1999) describes the logistics planning process like this

> Logistics planning, including movement and transportation planning, should be undertaken as an integral part of defense planning and be consistent with force and operational planning. It is essential, therefore, that both logistics and operations staffs have a clear understanding of each others' objectives, requirements and capabilities.

There are several key words in the quote above that are important to both the operational planners and the logistical planners. First, the planning process has to be integrated and consistent to make the best and most efficient use of its dedicated forces. Second, the planning process requires that the logistical planners understand and know the operational requirements. Third, the operational planners need to balance their objectives and operational requirements with logistical capabilities. The effect of all these factors is that the operational and logistical planners encounter the challenge of balancing efficiency with effectiveness in the operations.

A model (Figure 3) of a logistics and operational planning process is described in Naval Logistics Doctrine (NDP 4, 1995). This model shows how logistics and operational requirements are interdependent during the whole planning process.

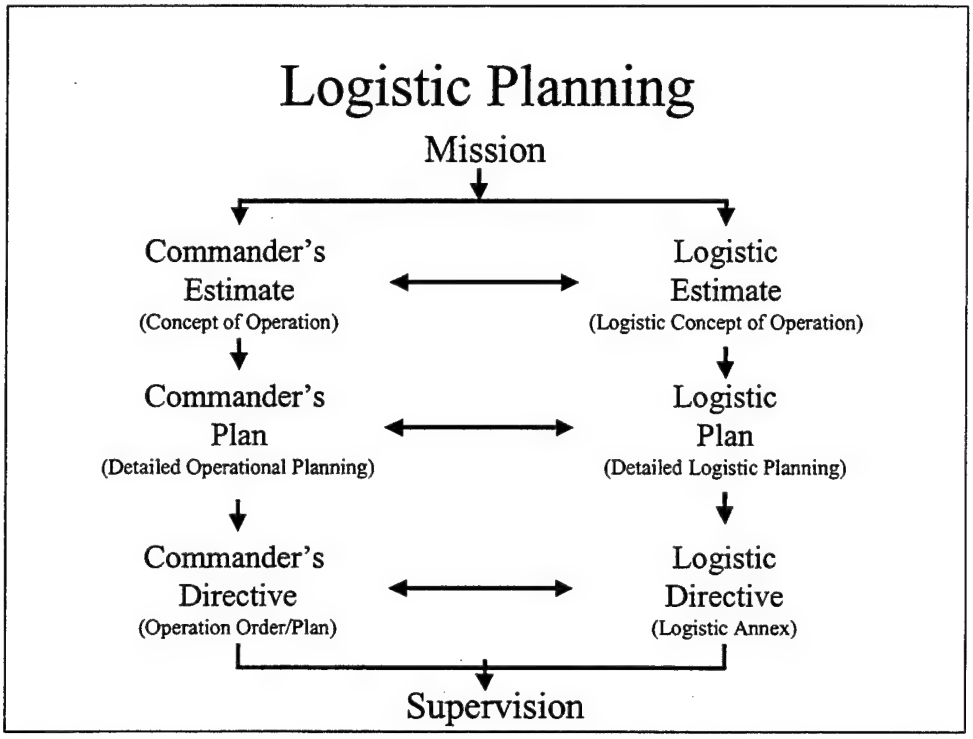

Figure 3. Logistic Planning Process from Naval Logistics (From: NDP 4, 1995)

Logistics can either improve or degrade the use of combat forces and vice versa. During the process the logistical and operational requirements have to be discussed and balanced to achieve the most efficient and effective use of both logistics and combat forces. This model is discussed in depth in both Naval Doctrine Publication 5 *Naval Planning* and Naval Warfare Publication 11 *Naval Operational Planning*.

Both the USAF and the RNoAF have encountered the challenge of balancing the move of the right blend of combat and support forces, equipment and supplies into the deployment area at the right time. The planning process for developing the right mixture of forces and logistics is an ongoing process in the two air forces. The planning and preparation can take years; nevertheless, crisis may only allow days or even hours before the forces are expected to deploy and be mission ready. This quick turn around time for

planning will affect logistical efficiency and effectiveness. Another factor that plays into effect is the total logistics resources that are available to the deploying force. Based on the agile logistics concept and NATO's principles of logistics, an air force encounters limitations on what to bring with the wing or squadron on deployment due to economical and efficiency reasons.

The USAF has numerous squadrons of F-16s while the RNoAF has only four F-16 squadrons, showing that the USAF has more resources available to equip their deploying squadrons. This difference in resources was also confirmed by the personnel responsible for the logistics support at Mountain Home AFB. They were able to maintain high fill rates for the deployable kits. For the RNoAF, pooling of resources and use of logistical support materiel are critical since the available resources are limited. In many cases the deployable squadron has to bring resources from the other F-16 squadrons resulting in a deployment having an negative effect on the mission capability of the squadron operating in Norway. On the other hand, these resources increase the operational effectiveness of the deployed squadron.

Both air forces have to balance what to bring during a deployment due to its budget and capacity limitations. However, the USAF has a bigger pool to draw logistics equipment and supplies from than the RNoAF, since it has so many squadrons that have the same support and logistics equipment. The agile logistics concept and the IRF concept, the RNoAF is developing, encounter the problem of balancing efficiency contra effectiveness. This is illustrated in the following model:

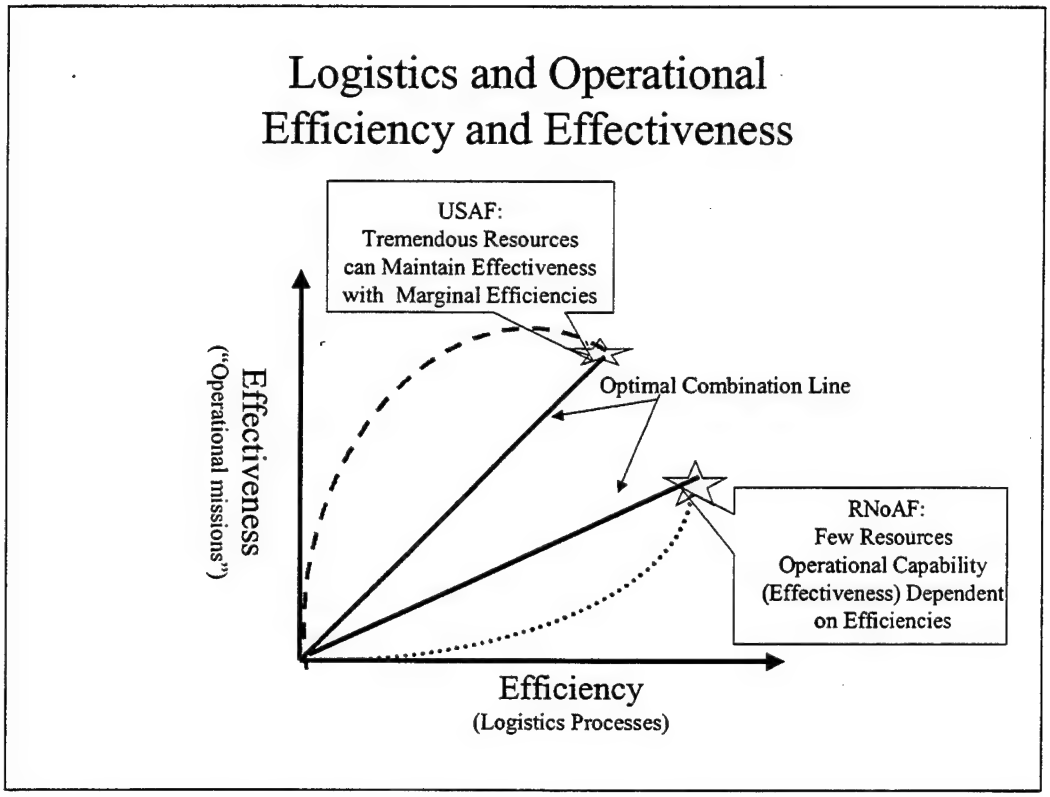

Figure 4. Logistics and Operational Efficiency and Effectiveness

The optimal solution to achieve maximum operational effectiveness could be to deploy as much logistics assets as possible to the deployment area. Then the war fighters would get the required equipment or service when ever needed. However, as previously discussed, that would be an expensive and infeasible way to organize logistics support.

Efficiency refers to the "capacity to produce results with the minimum expenditure of time, money, or material" (Websters, 1971: 725). Efficiency thus focus on the input-output ratio (Pennings and Goodman, 1977). To be efficient is to do things well, either it is logistics support or manning of the logistics support functions. Effectiveness, on the other hand, is defined as "productive of results" (Websters, 1971: 724). The focus is on doing the right thing and it is determined by an absolute level of either input

acquisition or outcome attainment (Pennings and Goodman, 1977). In military terms effectiveness can be measured in for example FMC or number of combat sorties flown etc. Both efficiency and effectiveness play an important part in organizational performance, yet the competition for resources each can interfere with the other, thereby resulting in a tension between the two (Roberts,1998). Efficiency depends on "focus", precision, repetition, analysis, discipline, and control" (March, 1995). Effectiveness, on the other hand, through the process of adaptation to the external environment like meeting the readiness goals and contingencies plan of sorties to be flown etc.

The most efficient way to organize logistics support often conflicts with the combat forces' need for required logistics support, therefore making it the least preferable operational alternative. In the model (Figure 4) the best mix is found on the straight line between efficiency and effectiveness. If planning is integrated and coordinated efficiently in advance, planning can achieve a synergy effect on each area reaching a optimum point illustrated by the stars.

The RNoAF and the USAF have a different option in balancing their logistics support for the deploying squadrons. However, the challenges for both air forces are to balance logistics efficiency with the effectiveness of the combat forces. In this chapter the tools that are used to achieve efficient logistics are described and in Chapter IV, the logistics concept of the two air forces is incorporated in the model based on the findings of the two systems.

3. A Model to Analyze the Logistical Planning Process

The logistical planning process for realizing an efficient logistics system is analyzed in a model, developed for this thesis, that also gives an overview of the inputs factors in the planning process. This model is a framework of the findings on how logistical planning is conducted in the two air forces.

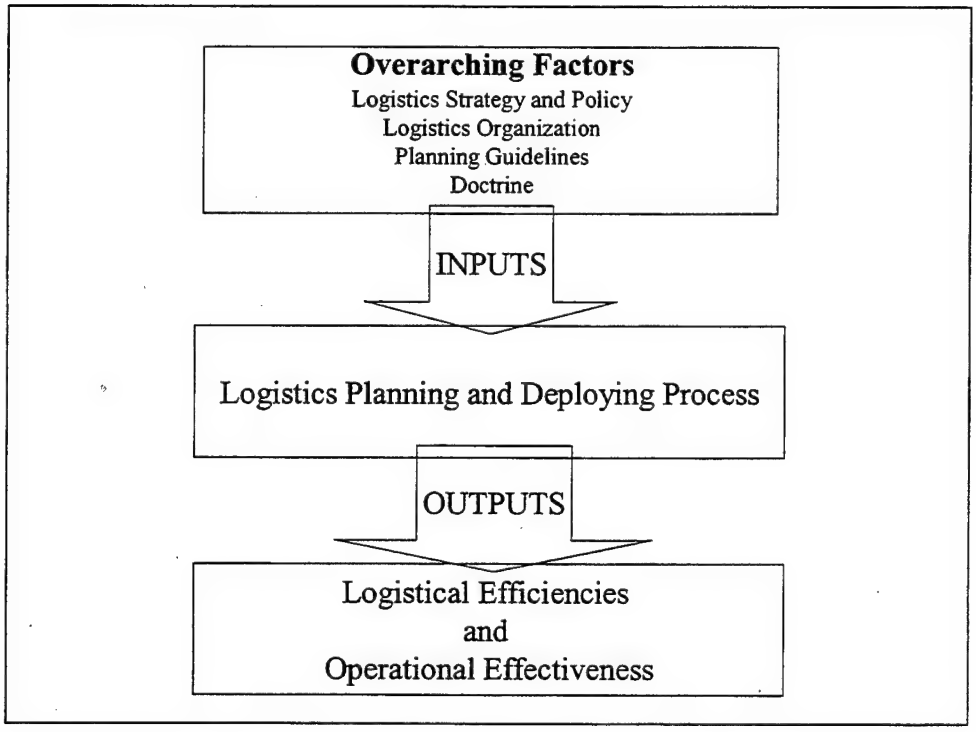

Figure 5. The Logistics Planning Process

Based on the model showed in Figure 5, the following research questions were developed:

- How is logistical planning organized in the two air forces?

- What requirements do the air forces encounter during the planning phase?
- How is the planning conducted in the two air forces?

This thesis compares the logistical challenges that the USAF and the RNoAF encounter when planning for deployment and sustainment of wings or squadrons, such as the AEF and IRF.

B. OVERARCHING FACTORS

1. Logistics Strategy and Policy

> Logistics comprises the means and arrangements which work out the plans of strategy and tactics. Strategy decides where to act; logistics brings the troops to this point (Joint Publication 4-0, 2000)[7].

This quote is from General Jomini, a French general serving under Napoleon. He wrote the book "The Art of War" in 1838 (Jomini, 1996) in which he discussed the relationship between logistics and operations. The principles he pointed out are based on the warfare from the 19th century. However, the relationship between logistics and operational planning that is discussed in his book is still valid today. Jomini divided the art of war into five branches, strategy, grand tactics, logistics, engineering and tactics. Since logistics was an important factor in the whole planning process. Jomini's masterpiece still has valuable lessons for the military planners of today.

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[7] General Antoine Henri Jomini, Precis de l'Art de la Guerre (The Art of War), 1838

To understand an air force's logistic concepts, it is necessary to know the organization's logistics strategy and policy. The strategy and policy decided at the upper command echelons provide input into the planning that takes place on the wing and squadron levels.

2. Logistics Strategy and Policy in the USAF

America's Air Force Vision 2020 – "Global Vigilance, Reach and Power" (America's Air Force Vision, 2000) gives guidelines for the development of the USAF. According to the vision, the Air Force is built upon following core competencies, aerospace superiority, information superiority, global attack, precision engagement, rapid global mobility and agile combat support. The vision says that combat support will be more agile and streamlined than in the past. The Air Staff plans to reduce the forward support footprint (logistics) by 50 percent, which means that the logistics support system must be more efficient. Because of this, the air force will rely on distributed (or reach back) operations to sustain the deployed forces in the future. The USAF strides to develop a system or process that is fast, flexible, responsive providing reliable support, so that the deployed forces are as effective with 50 percent less logistics footprint. The scope of this thesis, demonstrates how this strategy is transformed into planning that takes place at the wing level in the USAF organization.

The Air Force Vision 2020 concludes that the air force has returned to its expeditionary roots as a means to organize itself. The "new" Air Force consist of ten deployable Aerospace Expeditionary Forces or AEFs. Two, AEFs are always deployed or

on call to meet the current national requirements, while the remaining force trains, exercises and prepares for operations. Logistics is emphasized as an important factor in the AEF concept. Focusing on developing Expeditionary Combat Support (agile logistics) capabilities that underpin the ability to operate anywhere. Information technology, rapid transportation and the strengths of both the organic and the industrial logistics base are emphasized in the vision as critical to achieving a responsive, dependable and precise logistics support (efficient logistics system).

The term "lean logistics" was introduced in the USAF to describe the change that had to take place in the aftermath of the Cold War. The change required a move from a heavily staffed presence with most of the logistics support deployed forward with the forces, to a more lean logistics organization with the resources in the rear or located in the CONUS.

a) Agile Logistics

Agile logistics (formerly lean logistics) represents a large and revolutionary concept on how to organize logistics support for an air force. The concept was initiated in 1992, when it first changed the aircraft maintenance concept of repairable avionics and engines (RAND MR-1075-AF, 2000). Agile logistics focuses on a fundamental shift in the way the USAF approaches logistics support. Logistics support is changed from a forward located supply system to a transportation-based supply system. Instead of maintaining large inventories and manpower to support them with the deployed forces, the USAF has worked to improve efficiency by using integrated

information systems to locate and order spares and then optimizing express transportation services to expedite delivery. Logistics efficiencies and operational effectiveness are a result of the combination of deployed assets and the quality of the logistical processes F(X) = (Assets, Processes). This relationship is illustrated in the model below.

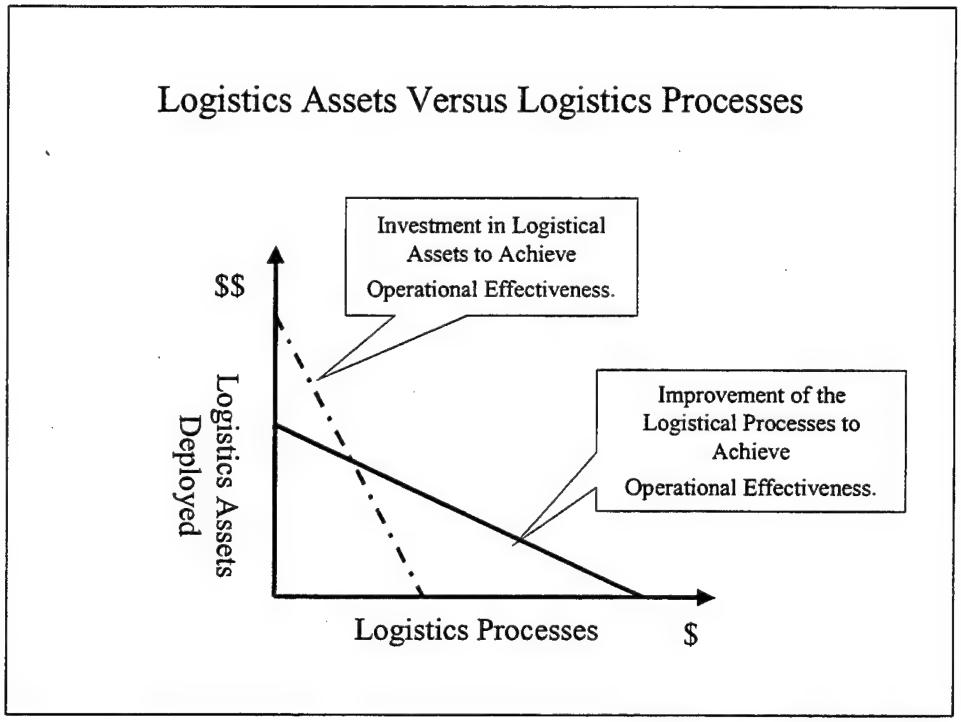

Figure 6. Logistics Assets Versus Logistics Processes

The agile logistics concept covers all the logistical challenges that an air force encounters today. The challenge is how to deploy an air force that is lighter, more flexible, quicker and more responsive than in the past and still be able to support sustained operations meeting the operational requirements? Another important question is how the logistical organization should be organized. The agile logistics concept has

proven to be beneficial on the strategic level, but how is it implemented on the wing and squadron level in the USAF organization?

3. Logistics Strategy and Policy in the RNoAF

Since the RNoAF has had a defined operational mission during the Cold War, most of the logistical preparation was to maximize the use of available resources to increase necessary logistical strength for sustaining operations until allied forces were deployed to Norway. This concept did not require mobility, responsiveness and the flexibility that are important factors in the new security environment. Today it is uncertain where the next deployment will take place, which demands different requirements from the logistical planners.

During the Cold War the planning assumptions were based on an Article 5 operation in which allied forces would be deployed to Norway. Therefore the logistical planning was based on NATO documents like, MC 319/1 (Military Committee – NATO Principles and Policies for Logistics) (SNLC, 1997) and NATO Logistics Handbook (NATO, 1998). NATO has published several documents that give requirements for its dedicated forces, for example ACE Forces Standards. Those documents have been incorporated in the planning that has been conducted in the RNoAF.

The RNoAF has never operated independently, but has always been deployed as part of an larger multi-national operation. Therefore the multinational aspects of an operation have been important in the planning phase. NATO has published its logistical principles in MC 319/1 that should be applied to the member nations' logistical planning.

The logistical principles that should be observed by the member nations are as follows (SNLC, 1997):

1. **Responsibility:** Nations and NATO authorities have a collective responsibility for logistic support of NATO's multinational operations.

2. **Provision:** Nations must ensure, individually or by cooperative arrangements, the provision of logistic resources to support their forces allocated to NATO during peace, crisis and conflict.

3. **Authority:** The NATO Commander at the appropriate level must be given sufficient authority over the logistic resources necessary to enable him to employ and sustain his forces in the most effective manner. The same should apply for non-NATO Commanders of multinational forces within a NATO led operation.

4. **Cooperation:** Cooperation among the nations' and NATO authorities is essential. For non-Article 5 operations, this cooperation must be extended to non-NATO nations, the UN, the WEU, the OSCE, and NGOs as appropriate.

5. **Coordination:** Coordination of logistic support between NATO and national authorities is essential and must be carried out at all appropriate levels and also with non-NATO nations, the UN, the WEU , the OSCE and other organizations as required.

6. **Sufficiency:** Levels and distribution of logistic resources must be sufficient to achieve designated levels of readiness, sustainability and mobility to provide the required military capability during peace, crisis and conflict.

7. **Economy:** Logistic resources must be used effectively, efficiently and economically.

8. **Flexibility:** Logistic support dedicated or organic to operational formations must be as dynamic, flexible, mobile and responsive as the operational formations themselves.

9. **Visibility:** The exchange of information between nations and NATO concerning logistic assets and capabilities is essential for the efficient management and coordination of support to NATO forces.

These principles have changed over the years with the alliance moving away from mainly focusing on Article 5 operations to also covering Non-Article 5 operations . The

decrease in the NATO nations' defense budgets have forced the alliance to look into new ways to ensure logistics support to its war fighters. The most important change has been the change in the principle – responsibility. Earlier logistics was a pure national responsibility, but now it is emphasized as a collective responsibility.

Based on the principles pointed out in MC/319 and the NATO Logistics Handbook, the Norwegian Armed Forces has developed a Directive for Logistics (FSJDIR, 1998), published by the Chief of Defense-Norway (CHOD). This directive is the source for all logistical planning that takes place in the Norwegian armed forces. The directive consist of one general chapter, another chapter with common logistical directives for all services and finally a chapter giving guidelines for service logistical planning. Since Norway has relied on a total defense concept, this directive is also used to incorporate the services and logistical support that should be supported from the civilian sector in case of a tense situation, crisis or war. Each service has their own chapter where its guidelines for the logistical planning are given. The purpose of the Logistics Directive is to give planning directions, so that the RNoAF MC and the individual bases and squadrons can plan for logistical support.

The RNoAF has not developed a long term vision like the USAF. However, when the RNoAF started a major reorganization named "Phoenix"in 1995, logistics was one of the areas that needed to be researched and developed. The decision to state a clear vision on how logistics should be organized and prepared for the future was not developed. A project was started in 1998 to define the logistical concept. This concept was published in 2000, but did not go into effect since Defense Study 2000 announced a completely reorganizing of the Norwegian Armed Forces including the RNoAF (Defense Study,

2000). Nevertheless, this Defense Study 2000 emphasizes that logistics for the future has to be mobile, flexible and responsive (efficient) so that it can support both national defense and deployable operations.

The CHOD-Norway has given his guidelines for logistical planning in the Logistics Directive. He stresses the importance of an integrated logistical and operational planning and makes several attempts to improve the planning process. In the future all logistical activities in the armed forces will be organized under one command named Forsvarets Logistikkorganisasjon (FLO) or translated into English the Armed Forces Logistics Organization. This organization showed in Figure 6 covers all three services' Material Commands.

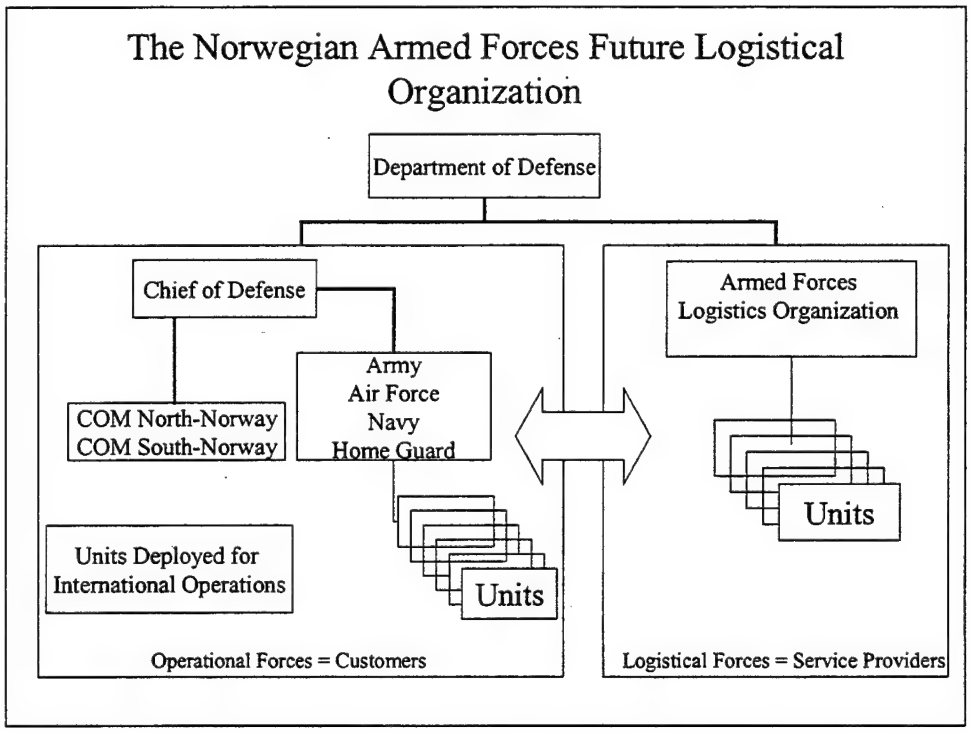

Figure 7. The Armed Forces Logistics Organization (From: White Paper No. 55)

The expectations are that this organization will reorganize the way the services have planned for deployment operations. This is a move towards joint planning and conducting of logistical operations, to achieve economies of scale and best practice in the way the service organizes its logistical support.

C. LOGISTICS DOCTRINE

> Doctrine consists of the fundamental principles by which military forces guide their actions in support of national objectives. It is the linchpin of successful military operations, and Air Force doctrine is meant to codify accumulated wisdom and provide a framework for the way we prepare for, plan, and conduct air and space operations. In application, doctrine must be treated with judgment but must never be dismissed out of hand or through ignorance of its principles (Air Force Doctrine Document 1, 1997).

1. The USAF Air Force Logistics Doctrine

The US Armed Forces have developed a vast number of different doctrines. Among those is the Doctrine for Logistics Support of Joint Operations (Joint publication 4-0, 2000). This doctrine describes how to organize and plan for logistics of joint operations. It gives references to other doctrines that are relevant for logistical planners. However, it is general in describing the logistical concept, and ,therefore, of limited value for the personnel involved in logistical planning at the wing level. The joint doctrine is a theoretical framework/background for the logistical planners. This is also the purpose of a doctrine; however based on the data gathered from the logistical planners, the doctrine was not a tool that they used in their education or day-to-day operation.

As the quotation from Air Force Doctrine Document 1 (AFDD) expresses, doctrine can be a powerful tool in the planning of an operation, logistical or operational, especially since it incorporates accumulated wisdom. Therefore, it would be expected that logistics doctrine was something that was used extensively among the logistical planners.

USAF has developed its own logistics doctrine, the Air Force Doctrine Document 40 (AFDD 40, 1994). Both the joint and the air force doctrine emphasize the importance of integrated operational and logistics planning. Logistics principles are pointed out in the two doctrines. The Air Force doctrine is designed in the same way as the joint doctrine. Since the last air force logistics doctrine was published in 1994, it is obsolete compared to the changes that have taken place in the USAF. However, the doctrine gives a broad perspective on the logistical processes that take place in the air force and the USAF logistics principles, and it outlines the importance of different logistics concepts and systems.

The logistical planners at the wing level preferred to use the Air Force Manuals (AFM) and Air Force Instructions (AFI) that gave them direction on how to conduct the planning. Doctrine was not a tool that was in use during the planning or preparation for operations. Most of the individual planners that were asked if they used the doctrine said that this was a tool they seldom or never used[8]. Doctrine was first used as educational tool at the Air Force Staff College, where personnel who had graduated from there

[8] Interviews among the logistical planners at Mountain Home AFB

expressed the opinion: "It was very interesting, but it is hard to adapt the doctrine into the detailed planning that takes place at the wing level[9]".

2. The RNoAF Doctrine

The RNoAF developed its first doctrine in 1964. In 1995 the second edition was published with the latest version published in 1999. Logistics was integrated in the operational doctrine, as part of ground-based support. In February 2000[10] the joint operational doctrine was published. Today, the plan is for the individual services to publish their own doctrine in accordance with the principal laid out in the joint doctrine. Because of this the Air Force doctrine has to be rewritten so it supports the joint doctrine enforcing logistics as an integrated part of both doctrines.

Since 1995, the Royal Norwegian Air Force Academy has been using the air force doctrine as part of its education for future officers in all branches. The logistical school in the RNoAF (Luftforsvarets Forvaltningsskole) has intensified the use of the doctrine, therefore increasing interest and understanding of its use. Shortcomings in the logistical part of the doctrine have been identified causing a discussion among logistics and operational officers. Like the USAF, the RNoAF has encountered the same challenges on how to apply the doctrine in the actual detailed planning for any deployment operations. Logistical planners have been given a tool that can communicate with the operational

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[9] Interviews with Maj Hackett and Maj Kephart, Mountain Home AFB January 2001

[10] HQ Norwegian Armed Forces: Joint Operational Doctrine, February 2000

branch to incorporate logistical requirements in the planning. Based on the information gathered from officers in the RNoAF[11], the benefits of using the doctrine, despite that it had no direct impact on the detailed logistical planning, they emphasized that the doctrine helped them to understand more of the whole operational concept and how logistics fits into the overall concept.

D. LOGISTICAL ORGANIZATION IN THE USAF

Basically, an organization military or civilian is a group of people intentionally organized to accomplish an overall, common goal or set of goals. Organizations can range in size from two people to tens of thousands. Comparing two organization, like the RNoAF and the USAF, is a challenge given the different size and number of people involved. The common goal or set of goals is similar for these two logistical organizations. Even though, the USAF and the RNoAF are organized differently to accomplish their common goal or set of goals. These differences are a natural consequence of the size and people involved in logistical planning. The organizational structure are described in the following paragraphs

[11] Phone interviews with LtCol Helge I Måseidvåg, Maj Frode Tvinnereim and Captain Frank Knudsen from RNoAF in January and February 2001

1. Logistics at the Strategic Level

The USAF is an complex organization (Figure 8) with its Headquarters US Air Force (HQ USAF) as the senior headquarters. The HQ USAF, consists of two major entities: the Secretariat (including the Secretary of the Air Force and the Secretary's principal staff), and the Air Staff, headed by the Chief of Staff. (Air Force Instruction 38-101, 1 July 1998).

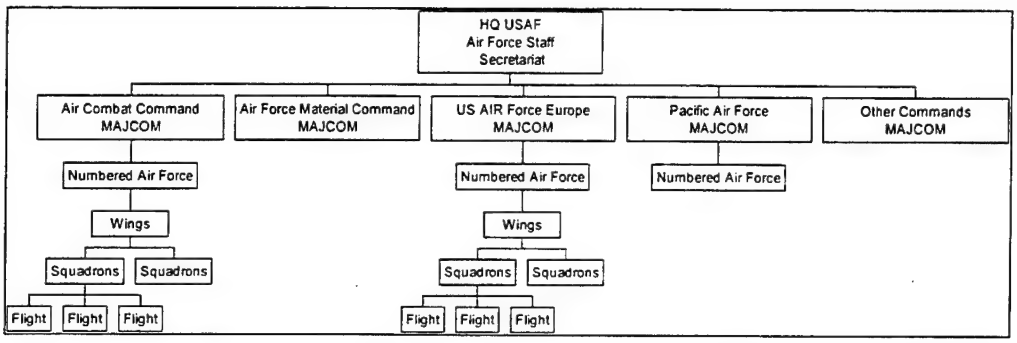

Figure 8. Organizational structure of the USAF (After: AFI 38-101)

The next level in the chain of command is the Major Commands (MAJCOM), which is a major subdivision of the Air Force, directly subordinate to HQ USAF. MAJCOM headquarters are management headquarters and, thus, have the full range of functional staff. MAJCOMs, in turn, may be subdivided into the following:

- Numbered Air Force Center
- Wing
- Squadron Division
- Flight

A MAJCOM can, for example, be either an operational command, like Air Combat Command (ACC) or a geographical command, like the Europe (USAFE) and Pacific Command (PACAF). MAJCOM can also be, an education and training command,

materiel command (AFMC) or space command (AFSPC). The operational commands like ACC, USAFE or PACAF have assigned Numbered Air Forces (NAF) that are divided into wings and squadrons.

The USAF has wings and squadrons deployed throughout the world with these forces belonging to the MAJCOM responsible for the area in which the squadrons are deployed.

The United States Air Force has one lead agency for logistics development, located in the HQ USAF, named Deputy Chief of Staff/Installation and Logistics (DCS/IL). It is the lead agency for development of policies and it provides resources to deliver effective agile combat support (ACS) for the full spectrum of an expeditionary aerospace force (EAF). This agency covers all the aspect of logistics from supply, services and maintenance to transportation [12].

The air force units that are stationed in the CONUS belong to Air Combat Command (ACC). ACC has the overall planning responsibility for the numbered air forces stationed in CONUS. ACC is responsible for the implementation of the AEF concept. Each MAJCOM has a Regional Supply Center that is a centralized office of logistics support for individual weapon systems, such as the F-16. ACC is divided into the 8th, 9th and 12th Air Force in the CONUS with its Headquarter at Langley AFB

Air Force Material Command (AFMC) does not play a major role in the logistical planning that takes place before a deployment. The AFMC has a more strategic function towards acquisition of new weapon systems. However, the result of the work taking place

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[12] AF/IL web site <http://www.il.hq.af.mil/>

in the AFMC has an indirect effect on the availability of spare parts and other resources when squadrons deploy.

2. Logistics Planning at the Base and Wing Level

The focus of this section is to analyze the logistical planning at the wing and squadron level. The size and number of squadrons in the USAF compared to the size of the RNoAF makes it difficult to compare the two organizations structure at the MAJCOM level. The USAF has divided the planning differently and has much more personnel on staff compared to the staff of the RNoAF. However, the logistical task that has to be conducted to ensure a successful deployment should be similar in the two organizations. In contrast, what was discovered during the research was that the two organizations varied in how the task was organized and accomplished

a) Wing Organization

Background on how logistical planning is organized was collected by interviewing personnel from different bases, air force publications, such as AFI and AFM, and public sites on Internet. All squadrons that are expected to deploy as part of the AEF concept belong to a wing (which is one of several wings in a NAF), where the Logistics Group implements the logistical planning.

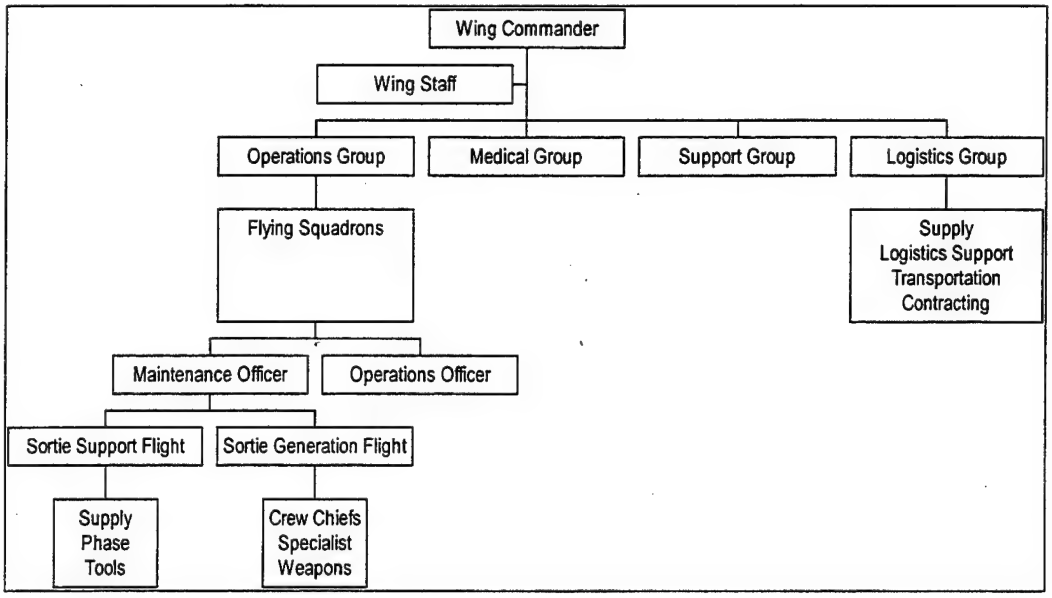

Figure 9. Wing Organization

A standard USAF wing will look similar to Figure 9, however there can be some differences depending on situational factors. For the purpose of logistical planning, the work accomplished in the Operations Group and Logistics Group is of greater interest for this thesis.

b) Logistics in the Operations Group

The Operations Group consists of the flying squadrons. The squadron includes a maintenance organization for the weapon platforms that are being used. Maintenance performed in the squadron is first level maintenance, since the USAF has been transformed into a two-level maintenance concept (Air Force Instruction 21-129, 1998). The flying squadrons have one Flight that cooperates with the Logistics group in the planning process: the Sortie Support Flight. According to the AFI (AFI 38-101,1998),

it functions as a supply liaison for the squadron. This Flight is also involved in the planning for movement of logistics resources belonging to the squadron like for example War Readiness Materiel (WRM). Based on interviews with personnel from this Flight at Mountain Home AFB, the personnel are required to cooperate closely with the Logistics Support Squadron to make sure that the data that were in the IT systems were correct. For supplies they had to cooperate with the personnel at the Supply Squadron, especially the Combat Operations Support Flight (LGSC).

c) Logistics in the Logistics Group

The Logistics Group consist of the following squadrons (Figure 9): Equipment, Maintenance, Logistics Support, Supply, Component Repair, Contracting and Transportation. However, there can be organizational variation from base to base depending on situational factors. In a comparison between the RNoAF and the USAF concept, the mission and organization of the Supply Squadron (LGS) and the Logistics Support Squadron (LGL) are studied.

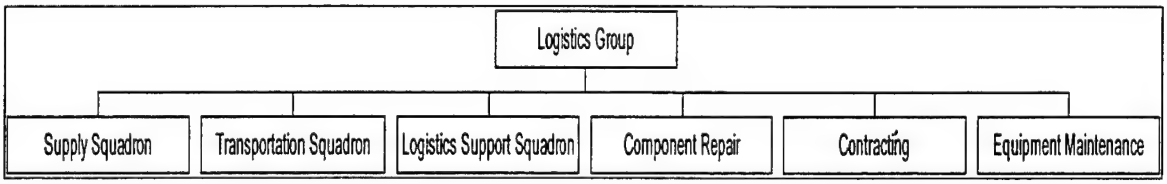

Figure 10. Logistics Group Organization

Logistical planning for deployments happens more or less in all the squadrons. Nevertheless, the squadrons that coordinate most of the logistical preparation

are the Logistics Support Squadron (LGL) and the Supply Squadron (LGS). The Logistics Support Squadron has a planning element which uses the tool Logistics Module (LOGMOD) and also coordinates deployment through its Deployment Coordination Center (DCC), activated during the deployment phase. Since the supply squadron is involved in the buildup of necessary logistics support like War Readiness Material (WRM) and Base Support Plan (BSP). These two squadrons will be further analyzed in this thesis.

d) Logistics Support Squadron

The Logistics Support Squadron (LGL) provides staff support to the Logistics Group for the individual flying squadrons and composite wing operations. The LGL develops, plans and implements programs for deployments, contingencies, and wartime taskings of the Air Expeditionary Wing. Additionally, the LGL manages aircraft maintenance training and wing enlisted maintenance manning. The Logistics Support Squadron is divided into three flights: Maintenance Training, Logistics Plans and Logistics Operations.

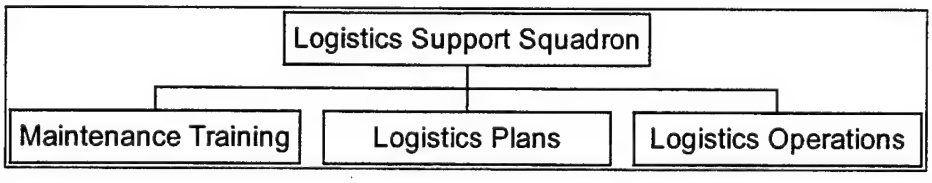

Figure 11. Logistics Support Squadron Organization

Logistics Plans is the coordination center for all logistics' input that is provided to the LOGMOD program, Base Support Planning (BSP) and the deployment center. One of the important task of deployment planning for LGL is providing and directing WRM management. LGL is, therefore, the focal point for base deployment exercises, deployment planning, and execution. The squadron coordinates base support planning (BSP) and act as the point of contact for support agreements. The LGL also coordinates logistics group input for flying schedules, performs analysis, acts as supply liaison, directs combat plans and programs, and manages the wing maintenance analysis database.

The personnel working in the LGL use extensively the software packages that have been developed at the MAJCOM. Most of the software have given the MAJCOM the capability of monitoring logistical status at the wing and NAF level. The logistical requirements were incorporated into the programs. If the wing wants to change the requirements or allowance of logistical support, they have to request for changes to the lead wing or the squadron that are responsible for developing the allowance for the weapon platform. If changes are required or proposed, it is done in cooperation with the flying squadron and the supply squadron.

e) Supply Squadron

The Supply Squadron (LGS) consists of four flights which also have organizational variations depending on situational factors: Combat Operations Support, Management and Systems, Fuels Management and Material Storage and Distribution (see

Figure 12). The primary focus of these flights is to maintain war readiness while supporting the Wing's peacetime and training missions.

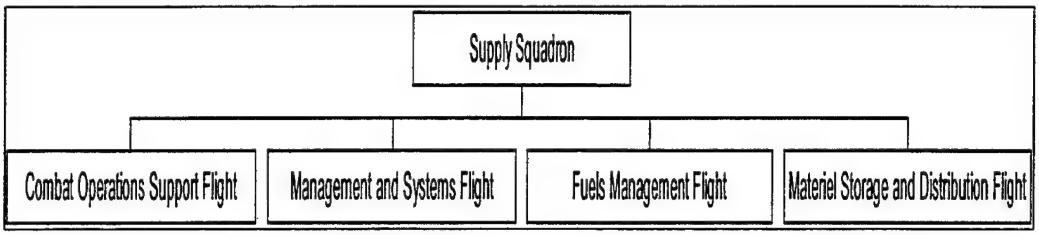

Figure 12. Supply Squadron Organization

Combat Operations Support Flight coordinates delivery of supplies to the deployable units. The Combat Operations Support Flight includes the following sections: Receiving, Mobility, Aircraft Parts Store, Readiness Spares Packages, Flight Service Center, and HAZMART Pharmacy. Personnel in this flight also take part in deployment becoming a section of the Deployment Support Center (DSC) which is a part of the deployed LGL.

The Management and Systems Flight includes the following sections: Procedures and Analysis, Funds Management, Customer Service and Training, Inventory, Document Control, Computer Operations, and Administration. This Flight is one of the units involved making preparations before squadrons deploy, such as providing customer training, managing the squadron training program, and being responsible for inventory and document control for host supply accounts and satellites.

The Fuel Management Flight mission is to deliver fuel products when and where needed to support the Air Expeditionary Wing in addition to the support of daily operations.

3. Focus

Based on the data collected on the field visits, the logistical planning in both the Logistics Plan Flight of the Logistic Support Squadron and the Combat Operations Support Flight of the Supply Squadron are comparable to the planning done in the RNoAF. Both flights are involved in the actual planning and contributing directly to the preparation and administration of a squadron deployment. The other flights are also highly relevant, but are beyond the scope of this thesis.

Another flight that is crucial to logistical planning is the flying squadron's Sortie Support Flight. The personnel in this flight execute coordinated plans staying involved during the whole planning process. Based on the data collected on the field trips, the Sortie Support Flight personnel were involved in the logistical preparation and planning that took place both in the Logistics Plans and the Combat Operations Support Flight. The mobility section was the execution element for most of the logistical activities that took place in the wing before the squadron deployed from the home base. The Sortie Generation Flight relied heavily on the data that were in the LOGMOD.

4. Summary of the USAF's Logistical Organization

The analysis of the USAF logistical organization has identified that the Logistics Support Squadron is the lead squadron at the wing level coordinating most of the logistical planning for deployment. This conclusion is based on the observation of the organization and mission defined for the squadrons in AFI 38-101. These observations were confirmed in interviews of involved logistical personnel from the different

squadrons[13]. Summarizing the quality of logistical planning is based on the interaction between the following squadrons and flights:

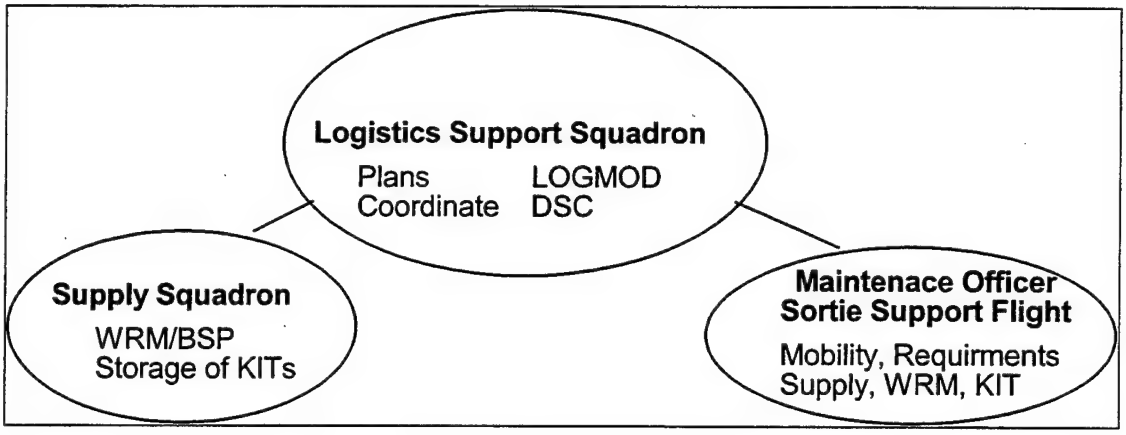

Figure 13. Main Logistical Players at the Wing Level

Another important observation is that all involved planners relied heavily on the tools developed to conduct logistical planning. USAF has developed several helpful tools to assist logistical personnel in the planning process. The whole planning process was more or less formalized and computerized and based on databases developed central in the USAF organization. This will be discussed later in the chapter.

E. LOGISTICAL ORGANIZATION IN THE RNOAF

1. Strategic Level

An operational organization chart of the Norwegian Armed forces and the RNoAF is presented in Figure 14 below. The operational and logistical requirements are

[13] Interviews of logistics personnel at Mountain Home AFB

set by the operational HQs in North and South. CHOD-Norway is responsible for the training and buildup of the forces so that they meet the requirements when needed.

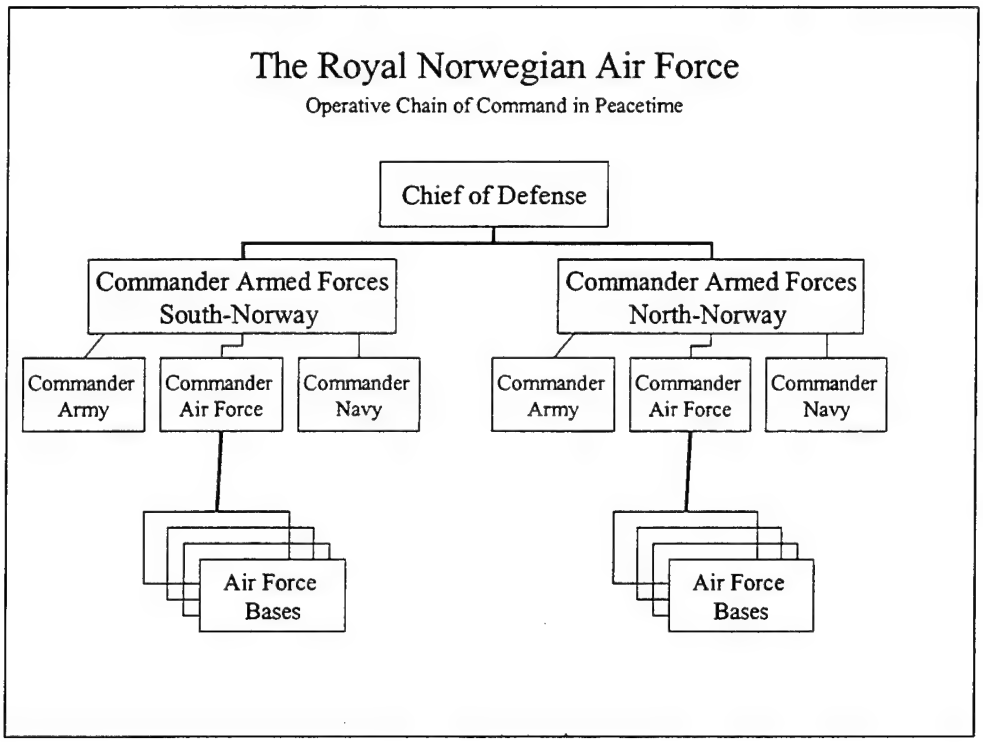

Figure 14. Operative Chain of Command for the RNoAF

The HQs requirements are published in the CHOD-Norway's Logistics Directive. The Air Staff is the lead agency for giving the overall policy for the RNoAF in accordance with CHOD-Norway's Logistics Directive. The air staff does not conduct any detailed logistical planning for IRF, this task is taken care of by the RNoAF Material Command (RNoAF MC) and the involved squadron. The Air Force Staff is responsible for the strategy and policy associated with training and construction the squadrons. The RNoAF MC is responsible for all procurement and buildup of logistics support, including WRM to the IRF squadron in accordance with the operational and logistical requirements given by the HQs. The Logistics Directive, therefore, gives requirements to the RNoAF

MC, the individual air force bases and the squadrons for plans that have to be developed for the deployable squadrons.

The RNoAF Staff does not have a logistical planning element like the AF/IL. However, the Norwegian Armed Forces have a joint logistics function (Operasjonsstaben/ Logistikkavdelingen) that has the responsibility of publishing and updating the Logistics Directive and giving logistical guidelines for the three services.

2. Air Force Material Command

According to CHOD's Logistics Directive – the RNoAF MC is responsible for conducting logistical planning for all RNoAF's forces and giving out directives that explain and describe how logistics support is to be carried out in peace, crisis, war and international operations (FSJLOGDIR, 1997). RNoAF MC is directly subordinate to CHOD-Norway. The Air Force Staff coordinates with the RNoAF MC based on the principles of horizontal cooperation (White Paper No. 55, 2000). It is the Logistics Management division at RNoAF MC that conducts logistical planning and publishes logistical directives for the IRF-squadron.

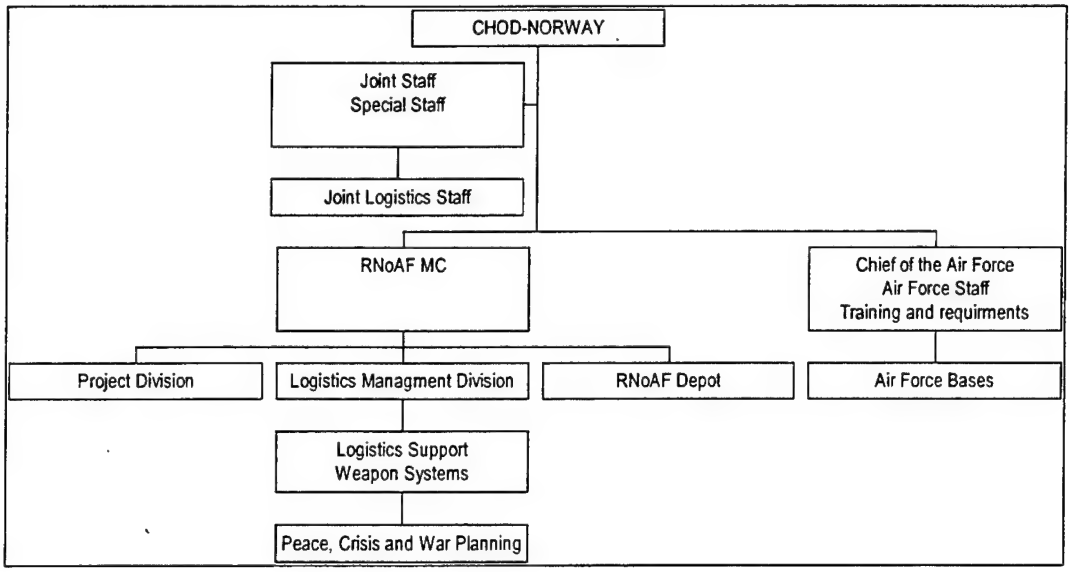

Figure 15. Chain of Command in the Norwegian Armed Forces (Focus on Logistics)

It is the RNoAF MC that conducts all procurement of spare parts and military designed equipment for the IRF squadron. The planning is done in close cooperation with the IRF squadron and its logistical planners.

When it was decided that Norway should equip a squadron for IRF, further a decision was made to dedicate a plan for the logistics support of this squadron. The plan is named "Internasjonal Operasjons KIT – for Luftforsvarets Innsettings Styrke" (IOK). The IOK describes the logistical organization and how logistics support is expected to take place. One appendix describes the allowance list of equipment expected to be taken with the squadron in case of deployment.

3. The IRF Squadron

The IRF squadron set up at Ørland AFB has been given the planning task. The base has, as a result of the IRF mission, established a planning element to support the buildup of the IRF squadron. This planning element consist of maintenance and logistics officers. They are working closely together with the RNoAF MC, which is the lead agency for logistical planning. The RNoAF MC is responsible for funding, while the squadron and RNoAF MC work closely together to work out what needs to be procured allowing the squadron to meet the logistical requirements set in the Logistics Directive and NATO directives.

The logistical planners are formed as a project organization outside the normal base structure. However, to achieve the goals set in IOK and given in the Logistics Directive, the planners have to cooperate with the supply squadron and the maintenance squadrons as well as balance the logistics support with the operations group's logistical requirements.

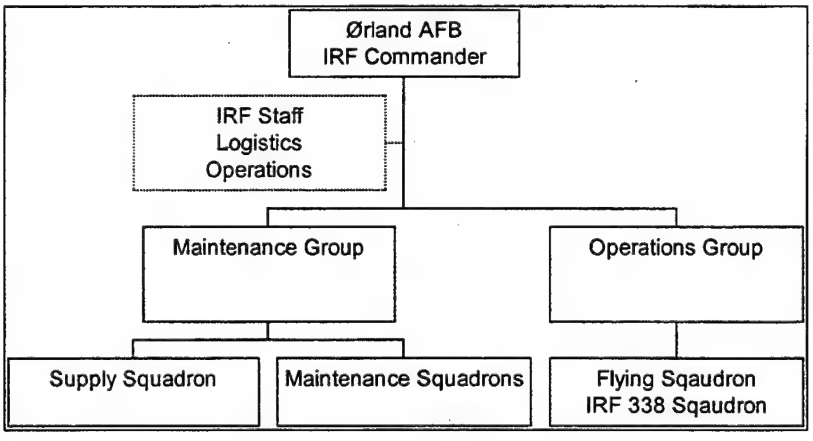

Figure 16. IRF Organization at Ørland AFB

F. LOGISTICAL PLANNING IN THE USAF

> A sound logistic plan is the foundation upon which a war operation should be based. If the necessary minimum of logistic support cannot be given to the combatant forces involved, the operation may fail, or at best be only partially successful[14].

This quote from Admiral Raymond A. Spruance, USN, Commander Fifth Fleet, 1946, is applicable to logistical planning that both the USAF and the RNoAF are conducting in preparation for operations of the 21st century.

1. Logistical Planning at the Wing Level

The main logistical planning at the wing is administered as identified earlier in the Logistics Group. In the Logistics Group the following squadrons execute most of the logistical planning at the tactical level: Logistics Support Squadron and the Supply Squadron. The Sortie Support Flight has been identified as the execution unit for most of the planning at the wing level. In the next paragraphs the tools that are available to the logistical planners are described. These tools are important in the work to achieve an efficient logistics system that meets the operational requirements.

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[14] Department of The Navy, Naval Doctrine Publication – 4, Naval Logistics, 10 January 1995

2. Base Support Planning

The USAF has developed several tools to support logistical planning on the squadron and wing level. One tool for logistical planning is a system called Base Support Planning (BSP) (AFI 10-404,2000[15]).

Base Support Planning is logistical planning accomplished to support unified and specific command wartime operations plans, as well as MAJCOM supporting plans. The BSP process supports the way logistics requirements are transformed into actual plans on the wing level. The BSP cuts across all functional support areas in a consolidated view of the wings' missions, requirements, capabilities and limitations. The BSP plans for actions and resources supporting war and contingency operations. The system is in use both at the MAJCOM level and at the wing level. The mission of the system is to quantify the existing capabilities of any operation location and to provide the foundation for conducting feasibility/capabilities analysis for a variety of employment driven requirements. At the unit level it represents a capability assessment of the employment plans. At the MAJCOM it represents quantifying theater/area of responsibilities (AOR) for support capabilities at the strategic level. The BSP identifies the total base resources and capabilities and the resources required to support contingency operations.

The baseline data for the BSP development and updates are the MAJCOM OPLANs, the TPFDD and the WAR Reserve Material (WRM) authorization documents (Figure 17). The logistical planning at the wing level aims to meet the requirements set in

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[15] Base Support Planning AFI 10-404 Draft

the BSP for contingency operations. The MAJCOM and the deploying units can pool resources based on the data from BSP when planning deployment to bases abroad.

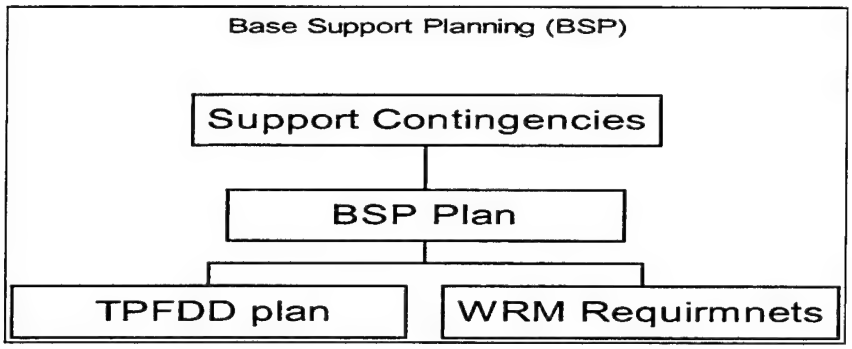

Figure 17. Base Support Plan Relations to the Other Plans

For the logistical planning at the wing level, BSP consolidates the requirements set by the MAJCOMs. The wing level make sure that they meet the requirements by collecting and feeding the program with data from the flights.

3. LOGMOD

Logistics Module (LOGMOD) is computer software that runs on the computers at both the MAJCOM, NAF and wing level. It is used to manage the database containing the logistics equipment and supplies for Air Force Unit Type Codes[16] (UTCs). The system consists of several modules which are in use on either the base or MAJCOM level. The LOGMOD is maintained and updated by the Logistics Support Squadron. The information has to be collected from both the flying squadron and the Supply Squadron.

[16] Unit Type Code (UTC) A five-character, alphanumeric code that uniquely identifies each type unit of the Armed Forces. (Joint Pub 1-02)

LOGMOD automates the development and distribution of UTC packages. It provides the capability to schedule, monitor, and control movement of cargo and personnel via air or surface modes of transportation. LOGMOD also provides standard reports for the management of authorized and real-time data to commanders for planned or contingency operations. If needed, logistics plans are generated for the different units, using the data on missions and number of aircraft that are planned deployed.

The MAJCOM creates and maintains the standard database of logistics supplies and equipment for each UTC in the Air Force. This database is called the Logistics Detail (LOGDET). The LOGMOD is also used to tailor or customize plans to the individual UTC databases of equipment and supplies for each USAF operational or contingency plan. This gives the individual wing or squadron the ability to produce deployment package lists for different configurations, For instance, when deploying eight aircraft instead of sixteen, the whole package of manning and logistics equipment is different. The allowance lists used in LOGMOD are developed and maintained by the lead wing and verified by Air Combat Command (ACC).

The wing level module of LOGMOD contains three subsystems the Logistics Force Packaging (LOGFOR), the Logistics Planning Subsystem (LOGPLAN) and Deployment Schedule of Events (DSOE). LOGFOR manages the standard database (LOGDET) of logistics supplies and equipment for each UTC on the base. LOGPLAN manages the plan's unique database of logistics supplies and equipment for each UTC the wing is tasked for in the USAF's operational and contingencies plans. The Deployment Schedule of Events (DSOE) subsystem provides the information necessary to exercises command and control of deployment actions. DSOE is an on-line schedule of events to

be used by the Deployment Control Center (DCC) personnel to monitor deployment processing status.

4. Logistics Contingency Assessment Tool

Logistics Contingency Assessment Tool (LOGCAT) is an instrument used for improved deployment planning at the Air Force wing level. The MAJCOMs and the Wing-level reception and beddown planners use the LOGCAT tool suit to conduct a site survey of a beddown location and to gather site capability information. The Logistics Plan section in the Logistics Support Squadron are the main user of LOGCAT for logistical planning at the wing level. LOGCAT is a decision support tool that consists of three major initiatives. These are:

- BCAT
- UTC-DT
- LOG-AID

The Beddown Capability Assessment Tool (BCAT) is a decision support software program that allows logistics planners to identify the reception-base capabilities to support the deploying squadrons. BCAT provides a time-phased comparison of weapon system operational and logistics requirements relative to site support capabilities during the initial stages of an AEF deployment. The tool relates results of the assessment in operational terms (sortie production) and allows the user to identify Limiting Factors (LIMFACs) and logistics shortfalls. BCAT improves USAF bed-down and deployment planning by automating the approved Base Support Planning process and obtaining data and planning factors from existing Joint/ USAF systems. As a result, the logistics planner

determines the resources required to support the beddown of deploying forces and the execution of combat operations at the beddown location. BCAT performs time-phased assessments in terms of operational capabilities relative to the site's organic capabilities and follow-on sustainment.

Unit Type Code Development and Tailoring (UTC-DT) is a tool that analyzes operational mission requirements, deployment site conditions and limiting factors in overages provided by BCAT assessments to determine optimal equipment and manpower listings. UTC-DT analyzes equipment and manpower requirements for a specific operational scenario and recommends quantities needed to accomplish the mission. Prior to any acceptance, the reception and deployment base planners evaluate the recommendations for validity.

Logistics Analysis to Improve Deployability (LOGAID) is a tool still under development. The goals of LOGAID are to reduce the deployment footprint, deployment response time, and utilize deployment resources more effectively and efficiently. The LOGAID project is a tool that will support the goal set for the agile logistics concept.

The LOGCAT and its three major initiative have formalized the deployment planning process and making it an important tool for the LGL and the personnel that conduct site survey before an deployment. Data that previously were stored on papers are now fed into the program so that it also can be used more efficiently for later deployments. LOGCAT is used extensively among the personnel in the DSC.

5. War Reserve Materiel

War Reserve Materiel (WRM) is materiel that is required in addition to primary operating stocks. This equipment also facilitates obtaining objectives for a deployment in the scenarios supported for sustainability planning in the Defense Planning Guidance[17]. The WRM is critical for all logistical planning since it has an direct impact on the deploying squadrons' capability to fulfill its missions. The WRM planning takes place in the LGS. They have a tool available called, Dynametric Analysis System (DMAS), to assist the planners in assembling the WRMs for the individual squadron. DMAS, was developed for the USAF, is a forecasting technique software package. The WRM consists of spare parts expected to be required during the first period of a deployment. The Regional Supply Center will establish supply lines either from CONUS or from the AOR to re-supply the deployed squadrons. The WRMs are approved by the system component office at the Regional Supply Center in the ACC.

6. Deployment Planning

The USAF has developed a Integrated Deployment System (IDS). IDS consist of five independent data-based systems that assist the wing level planners in managing their deployment requirements. The system also provides in-transit visibility for the wing's assets.

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[17] Defense Planning Guidance see definition in Appendix A

- LOGMOD-B (Logistics Module) receives and maintains the cargo portion of the wing's required equipment and supplies. It maintains detailed record of the logistics supplies that are to be deployed (NATO Stock Number, weight, cubic etc.)

- MANPER-B (Manpower and Personal Module) receives and maintains the personnel data for UTCs and tasking.

- DeMS (Deploymnet Management System) is a unit level program to manage personnel and cargo data. It provides units commanders with the ability to track information on shots, training, personnel and cargo details.

- CMOS (Cargo Movement Operating System) is a transportation system that automates manifesting movement of cargo and personnel. It also provides in-transit viability. It is possible to track the cargo from the home base to the deployment location. It can also be monitored from base level or higher headquarters.

- CALM (Computer Aided Load Planning and Manifesting) is a automated load planning to ensure proper weight and balance of aircraft cargo load as well as optimal use of available cabin limits.

This system, IDS is a software package that has computerized and formalized the whole deployment operation in the transition phase from home base to the deployed area.

7. Supply Lines and Re-supply

Logistical planning aims to build up the WRM and KITs so that the deploying units are self sustained in the first period of a deployment. Up to this point, logistical preparation is based on a push concept, which means that the deploying units takes what it expects to be required based on the data from the UTC lists. The materiel information system makes it possible to communicate with the home base. Nevertheless, the deploying unit is expected to coordinate with the Regional Supply Center (RSC) for the area where it is deployed (MAJCOM). The RSC is responsible for receiving the requested supplies. Because of this they can avoid reaching back to, for example, CONUS to get a re-supply. This practice is in accordance with the agile logistics concept. There are different means of transporting the supplies, but they are generally moved using commercial transporters when applicable. The RSC transports the supplies onward to a designated point, where a tactical airlift carries the supplies to the deployed squadron. The procedures in the AEF concept on how to organize the re-supply is described in detail in several AFIs and in the Commanders' Playbook (ACC, 2000).

8. Time-Phased Force and Deployment Data

Time-Phased Force and Deployment Data (TPFDD) is also a key document for logistical planners. This plan contains time-phased force data, non-unit-related cargo and personnel data, and movement data for the operation plan, including the following:

- In-place units.
- Units to be deployed to support the operation plan with a priority indicating the desired sequence for their arrival at the port of debarkation.
- Routing of forces to be deployed.
- Movement data associated with deploying forces.
- Estimates of non-unit-related cargo and personnel movements to be conducted concurrently with the deployment of forces.
- Estimate of transportation requirements that must be fulfilled by common-user lift resources as well as those requirements that can be fulfilled by assigned or attached transportation resources.

The TPFDD has impact on all the logistical planning conducted before a deployment. It regulates what the deploying forces takes and what support is expected in the deploying area. It also influences when to send the cargo and what cargo to send first. This operational plan influences how the squadron organizes it logistics in order to be fully operational in the deployed area.

9. Summarized - Logistical Planning in the USAF

The description of the USAF conducting is logistical planning for deployment shows that the organization has moved into the digital arena. The planning process has

been heavily computerized over the last decade. The challenge for planners is to connect and feed the systems with available and correct data. The systems are developed over the years based on experiences and problems encountered in earlier deployments. The requirements are developed and centrally standardized in the organization, which are then used for all similar squadrons.

G. LOGISTICAL PLANNING IN THE RNOAF

1. Size and Concept

Logistics is, as the NATO definition in Appendix A shows, a combination of science and art. The logistical planners try to predict requirements for the deployment environment, and the expected usage rates that will be encountered during the deployment. Optimizing logistical support is an art in balancing the different requirements with available logistics support - not to mention the aspect of "fog and friction". The RNoAF does not have the same amount of aircraft and inventory as the USAF, therefore, making logistical planning even more difficult. If the deploying squadron takes more than it requires, the squadrons conducting training and preparation at home are negatively affected. On the other hand, the deploying squadron needs to have sufficient logistical support to meet the operational requirements. The balance between operational effectiveness and logistical efficiency is a traded off between the deploying squadron and the squadrons that are going to operate at home.

In the logistical planning phase, the RNoAF encounters the same logistical challenges as the USAF although the two concept are quite different in size and how the

actual planning is conducted. The USAF has formalized most of their planning phases (AFI, AFM) and has also developed computerized tools to structure and formalize the logistical planning process. The main parameters that direct the planning are updated and maintained at the central level in the organization.

The RNoAF, on the other hand, has approached the challenge of deploying air forces abroad as an new and unique task. Its logistical concept and organization were developed during the process. This approach gives authority to the individual squadrons and requires a close coordination between the RNoAF MC and the squadrons dedicated for operations abroad.

The RNoAF MC has had an important role in directing the development, since it has been given the logistical planning responsibilities for all the air force bases and units. However, most of the execution and detailed planning has taken place at the wing/squadron level[18].The whole planning process has enhanced the communication between the involved logistical personnel at Ørland AFB. The logistical planners for the IRF squadron have, as a result of the unique task, established a close connection with the responsible logistics personnel at the RNoAF MC. This is required due to the unique task and the RNoAF MC's national planning responsibility. Funding and procurement are also managed by the RNoAF MC, which requires input from the IRF squadron.

The RNoAF established a project when the IRF task was given in 1992. The project involved personnel from the IRF squadron and RNoAF MC who developed and

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[18] Phone interviews with Maj Frode Tvinnereim and Capt Frank Knutsen February and March 2001

reported logistical requirements and shortcomings This project established the framework for the logistical planning process to prepare IRF for international deployments.

2. Organization at the Execution Level

The RNoAF is going through a reorganization process, so the organization will be slightly different from base to base. Logistical planning by the IRF is conducted as a joint effort at the base level, managed by the IRF planning staff. This staff is linked to the RNoAF MC and to the Air Staff. The chain of command is through the base commander, however the planning staff is the addressing unit for logistical questions together with the Maintenance Squadron and Supply Squadrons. The IRF staff works closely together with the maintenance squadrons and the Supply Squadron in the development of logistics support.

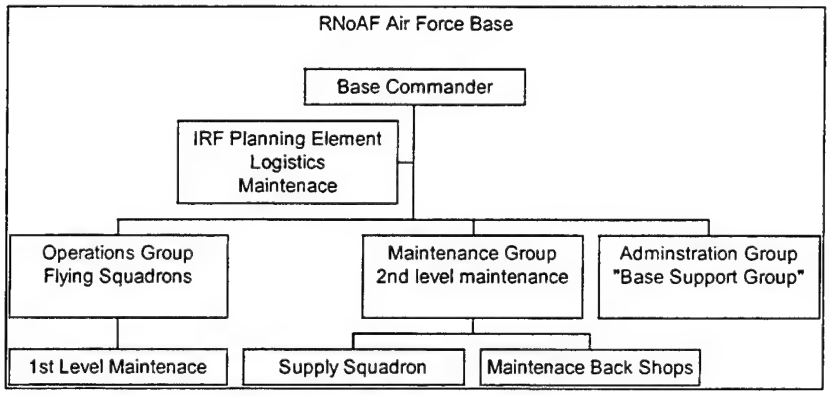

Figure 18. Organization at the Execution Level

The IRF planning staff cooperate with the Supply squadron in maintaining and developing requirements for the squadron in case of a deployment. It is a joint effort to meet the requirements with the allowance list being approved by the RNoAF MC. The

Supply squadron is also responsible for the day to day support on the base. Due to the workload on the Supply Squadron, the decision was made to establish the IRF planning element to ensure proper buildup of the IRF squadron. The logistics element is the point of contact for all logistics issues concerning the IRF squadron.

3. Planning Requirements

The logistical requirements for the committed forces, which are dedicated international operations, of the RNoAF are given in DOK 2[19]. The requirements state the number of days in which the squadron should be ready to deploy and the number of days of supplies are required to be stocked. In addition to DOK 2, the CHOD-Norway published the Logistics directive giving guidelines for all logistical planning, either in national defense or international operations. The directive is still under development, but, when finished, it will cover all aspects of logistics according to the NATO definition of logistics[20].

The RNoAF MC is responsible for publishing and maintaining the logistical plans for the IRF squadron. The RNoAF MC has published a plan, named Luftforsvarets Insettingsstyrker - International Operations KIT (IOK) covering all the aspects of logistics necessary for conducting operations with the IRF squadron. This plan has been developed in close cooperation with the squadron. However, the responsibility for

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[19] DOK 2 is the medium-term to long-term planning document for the Norwegian Armed forces.

[20] Definition in Appendix A

publishing and updating the plan is with the RNoAF MC. The deploying squadron has also developed detailed plans on how it will conducting a deployment, also incorporated in the IOK plan. The development of the IOK plan was, additionally, also coordinated with NATO and national publication. The aim is to meet the logistical requirements set by NATO and national authorities. In comparison with the USAF most of these plans are paper-based.

4. Tools

The planning for the IRF squadron and the other RNoAF deployable squadrons has been a team effort among the different branches and command levels. There were no previous experiences to follow when the planning for IRF started. Since all planning had been directed towards deployment to its own bases or operations out of its own bases. The USAF has, over the last decade, developed several tools to assist them in planning for deployment operations. The RNoAF, on the other hand, has only a computer-based materiel information system (Integrated Material and Administration System -IMAS). This program assists the logistical planner to meet the requirements for Class supplies (NATO Class I-V supplies).

Moreover, there is an ongoing effort in NATO to develop new deployments tools like the Allied Deployment and Movement System (ADAMS) to assist in mobility and movement management during NATO operations. This system has features like movement, sustainment and transportation planning, deployment analysis, force tracking.

However, theses tools are not integrated into the existing system and are still under development.

The lack of a centralized computer based network enforces the need for close cooperation with all involved squadrons and commands to achieve efficient logistical planning. Given the size of the RNoAF, it is not required to have the amount of available tools that the USAF. The logistical planners have continuous communication with the key planners both in the Air Staff and at the RNoAF MC. On the other hand, as shown for the USAF, the planning process in the RNoAF could unquestionably benefit of having some tools that would support the logistical and operational planning process.

5. The RNoAF MC and the Deploying Squadron

The RNoAF MC is responsible for planning the class supplies that the deploying squadron requires in case of an deployment. To assist in the planning for determining the requirements, a discussion is required between the technician and the logistics people to develop an allowance list. The allowance list is based on previous deployment and analysis of information used when operating from home the base. The information used for planning purpose are collected from the IMAS system since the RNoAF does not have tools like the USAF's DMAS.

Another shortcoming is the limited resources available for investing in class supplies, especially spare parts and test equipment. This shortcoming is overcommed by dedicating certain supplies from other squadrons, in the case of a deployment. The RNoAF MC is responsible for all acquisition of military supplies to the weapon system.

Therefore, the squadron and the RNoAF MC has to cooperate closely during the entire process. This cooperation requires information and problems to be exchanged and solutions to be worked out in collaboratively.

6. Logistics Under Deployment

The IRF squadron, when deployed, establishs a Logistics Coordination Cell at its home base. This cell is responsible for all logistic support for the deployed squadron. If the home base is not able to satisfy the request, the request will be forwarded to the RNoAF MC. The home base coordinates the re-supply along with the RNoAF MC. The transportation to the deployed squadron is managed by the RNoAF MC, since they have the knowledge and expertise to manage requirements, like getting the re-supplies through customs in the deployed country. The re-supply process requires close cooperation between the home base and the RNoAF MC to locate where to obtain the material and how to transport the re-supply to the deployed forces.

IV. COMPARISON OF THE TWO LOGISTICS CONCEPTS

A. INTRODUCTION

To compare two logistics concepts, like the USAF and the RNoAF, is a challenge. First, there is a big difference in size and the number of people involved in the two organizations. Secondly, the two organizations have evolved differently. The USAF has been deploying overseas since it was founded, while the RNoAF has always been preparing for defense, operating from Norwegian territory. Thirdly, the USAF has a greater pool of logistics resources than the RNoAF due to the vast number of squadrons and aircraft.

In both air forces, organizational structure and tools available are the results of the organizational development and operational experiences during the Cold War, which now have to be transformed to the concept of the 21st century.

An effective and efficient logistics organization is a vital part of an air force's strategic management process. The challenges of the USAF and the RNoAF forces do not lie with strategic decision-making. The manner in which the agile logistics concept of the USAF is described shows the importance of logistics at the strategic level. The RNoAF has not developed as clear a strategic plan as the USAF, since most of the long term goals are described in the CHOD- Norway's Logistics Directive. The missing part in the RNoAF strategic plan is how the organization is expected to reach the goals set in the directive. However, the logistics strategy in the RNoAF is aimed at meeting the NATO requirements. The RNoAF, nevertheless, can benefit by developing a strategy similar to

the agile logistics concept. In this strategy, the main area of the future logistics concepts should be incorporated. By doing this, shortcomings in the existing structure and concept would be visualized. The focus would then be placed on how to develop a structure and system supporting the long term strategic goals. This would improve the relationship between short term and long term goals in connection with developing a structure that supports flexibility, responsiveness and sustainability of the logistics and operational organization.

The main logistical challenges encountered by the two air forces is balancing operational effectiveness with logistical efficiencies. This goal, of reaching the optimal balance, is a function of the system design, structure, mission, organization and operational requirements versus logistical support concepts and available resources. Both the USAF and the RNoAF are moving towards a more flexible, mobile, deployable and responsive system that requires the forces to maximize the operational effectiveness by improving the logistics efficiencies. This thesis shows that the USAF and the RNoAF has and will decidedly balance those two factors differently in the future. This difference is due to the USAF possessing more available resources than the RNoAF given the size of the USAF and structure of the existing organizations.

B. BALANCING EFFECTIVENESS WITH EFFICIENCY

In Chapter II Figure 1 (Employment-Driven Analytical Framework) a conceptual model of the relationship between operational requirements, such as type of mission and weapons, number of sorties, was balanced with the logistics support concepts available.

These requirements need, as shown in Chapter III Figure 3 (Integrated Planning Process), to be balanced to maximize the effectiveness and efficiencies of both the operational and logistical assets. Figure 1 in Chapter II also demonstrated how a different logistical concept contributes to a certain risk, flexibility, cost, spin-up time and logistics footprint depending on which factors are emphasized in the planning and deployment phase.

The USAF has proven to be effective on deploying their squadrons and the new AEF concept (Dowdy, 2000). However, one of the main criticism of the old concept was that the organization and the logistical footprint was too big, affecting the spin-up time and cost. However, based on the amount of logistics brought into the area, the deploying units were both able to be operational effective while maintaining sustained operations. The uses of the logistics resources were not efficient, since the old concept required many more assets deployed than necessary to meet the operational requirements.

If the main focus of the air force was only effectiveness at the cost of efficiency, the challenge would be to get funding to support investment in logistics assets so that the required level could be achieved. A situation like this is presented in Figure 19, where operational requirements are met by investing heavily in logistics assets and very little in process efficiencies. The figure shows that it is possible to buy effectiveness (illustrated by $), but it requires defense spending to be directed to assets for improving the effectiveness of the operational forces. The investment could be in, for example, logistical organization, maintenance assets or spare parts.

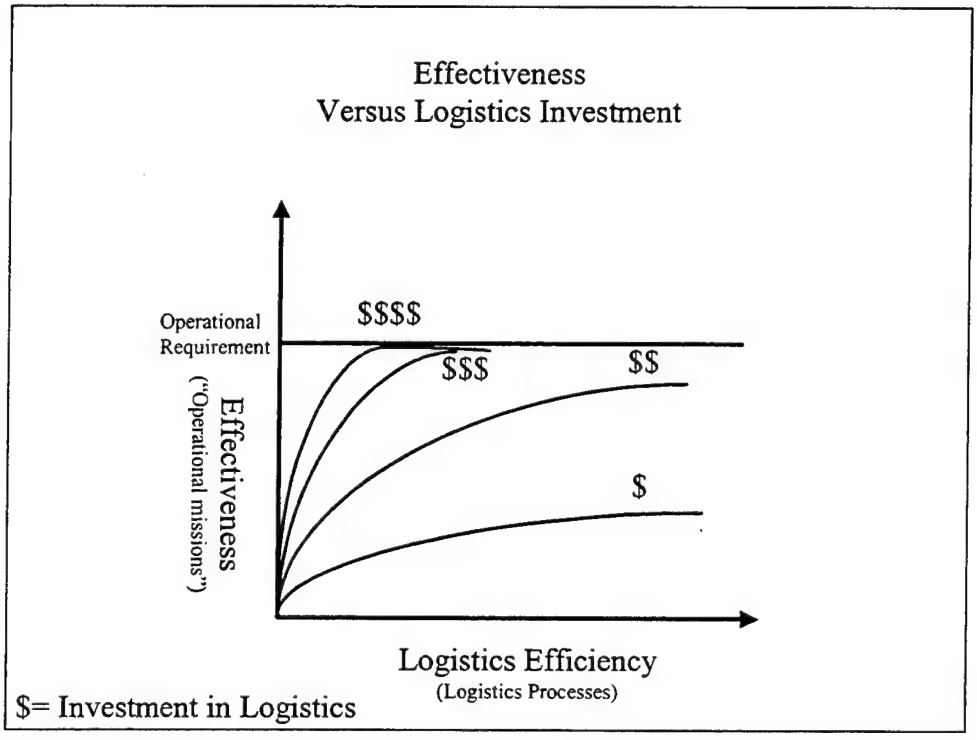

Figure 19. Relationship Effectiveness Versus Logistics Investment

The deploying forces have been able to meet the operational requirements like number of sorties and sustained operations. This has been achieved at the cost of an inefficient logistics system. The logistical cost of inefficiencies is, for example, too many people, spare parts and equipment being deployed. These logistical assets could be used in other operations or deployed to other contingencies, if necessary. The challenge remains to select the right mixture of logistical assets combined with efficient systems that contribute to the required level of operational effectiveness.

The agile logistics concept aims to reduce the logistical footprint, be more flexible and reduce the logistical cost. Based on the graph in Figure 20, the USAF wants to make a shift rightward by improving the logistics processes in order to meet the operational requirements. Their goal is to achieve the operational requirements with less investment

in assets and improve the performance of the logistical systems. The total cost (illustrated by the $) is less than by only investing in assets (Figure 19).

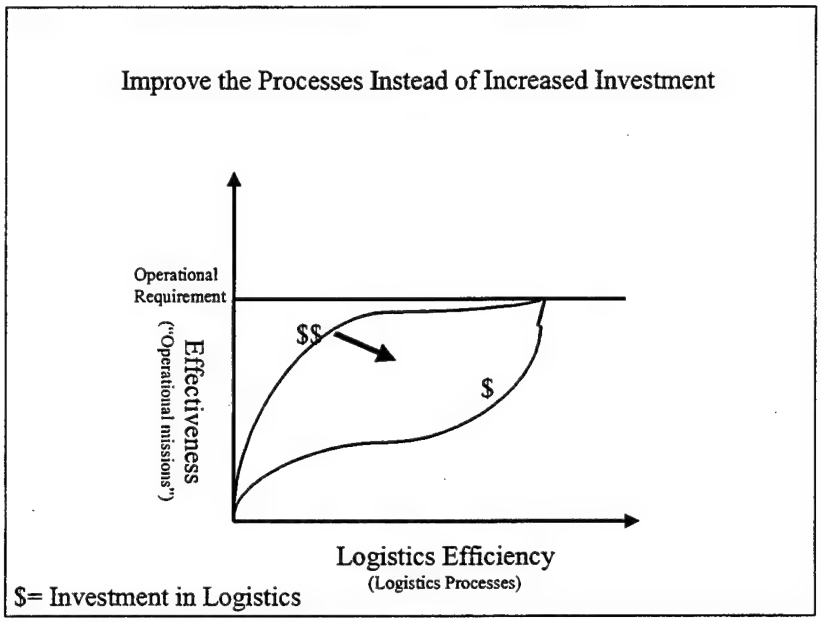

Figure 20. Improved Logistics Processes Versus Investment

The rightward shift is less expensive since improving a process is less expensive than investing in structure and/or logistical assets. A process improvement is also more flexible in adapting to future changes like implementing new weapons platform or organizational configurations.

The RNoAF can learn an important lesson from this process: how to improve the operational effectiveness by investing in efficient logistics systems. The situation of deploying forces abroad is new, and given the resources, Norway does not have the specter of opportunities to design such a logistical concept as the USAF has. The RNoAF does not have excess logistics assets, and the deployments that have taken place as part of exercises or during operation Allied Force demonstrated that the IRF squadron had to

pool or share the resources from the remaining squadrons. If the IRF brings too much logistics asset to an operation, it will affect those squadrons in Norway training for their primary mission, the defense of the Norwegian territory. This means that the deploying squadron needs emphasize developing an efficient logistics system that supports and meets the operational requirements. This challenge of meeting the operational requirements in Norway and for deployment operations are illustrated in Figure 21.

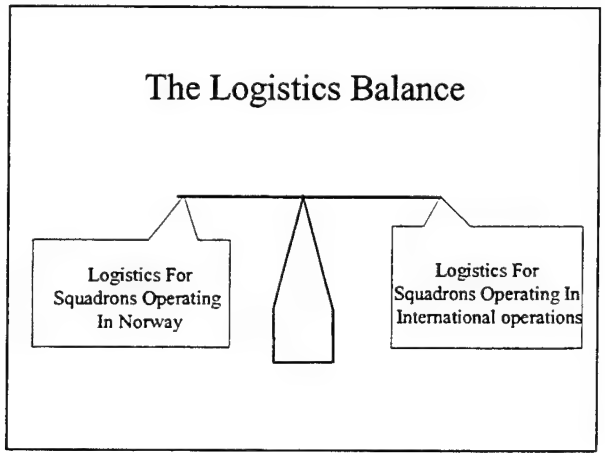

Figure 21. The Logistics Balance

The RNoAF cannot afford to be inefficient when they solve logistical support for the deploying squadrons. Graphically illustrated the RNoAF logistical system has to support the operational effectiveness by operating on a line with least logistics cost (marked with $), and with the most efficient processes. This is illustrated in Figure 22. Since the RNoAF does not have the amount of available resources that the USAF does, they have to be extremely efficient in the way logistics is planned, procured and delivered to reach the goal of the operational requirements.

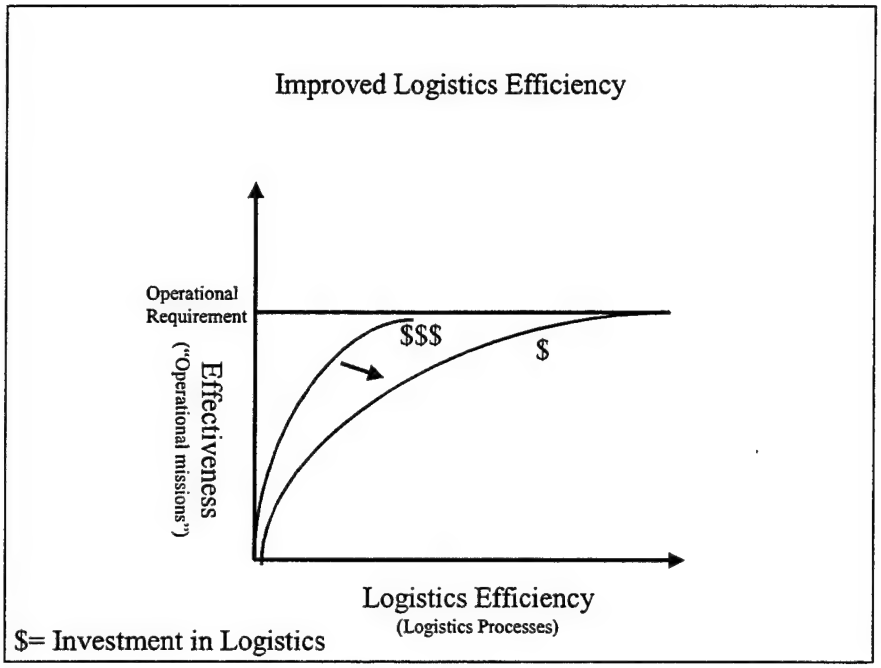

Figure 22. Improved Logistics Efficiency

To develop an efficient logistics system requires trade-offs between logistics assets and resources (i.e. parts, manpower, tools) and logistical processes (i.e. deliver means, computer programs). In Chapter III the logistical organization, and tools available in the USAF and the RNoAF were discussed. The USAF has been able to maintain the effectiveness at the cost of relative inefficient logistics systems; however, they are now developing systems that can improve the logistical efficiency in order to maintain the same level of operational effectiveness with fewer resources.

C. HOW TO IMPROVE LOGISTICS EFFICIENCIES?

Efficiencies of the logistical systems depend on how responsive the system and the designed process are meeting the war fighters' requirements. For the logistical planners it means developing the optimal mixture of assets in respect to the responsiveness of the logistical processes. Graphically this can be illustrated as follows:

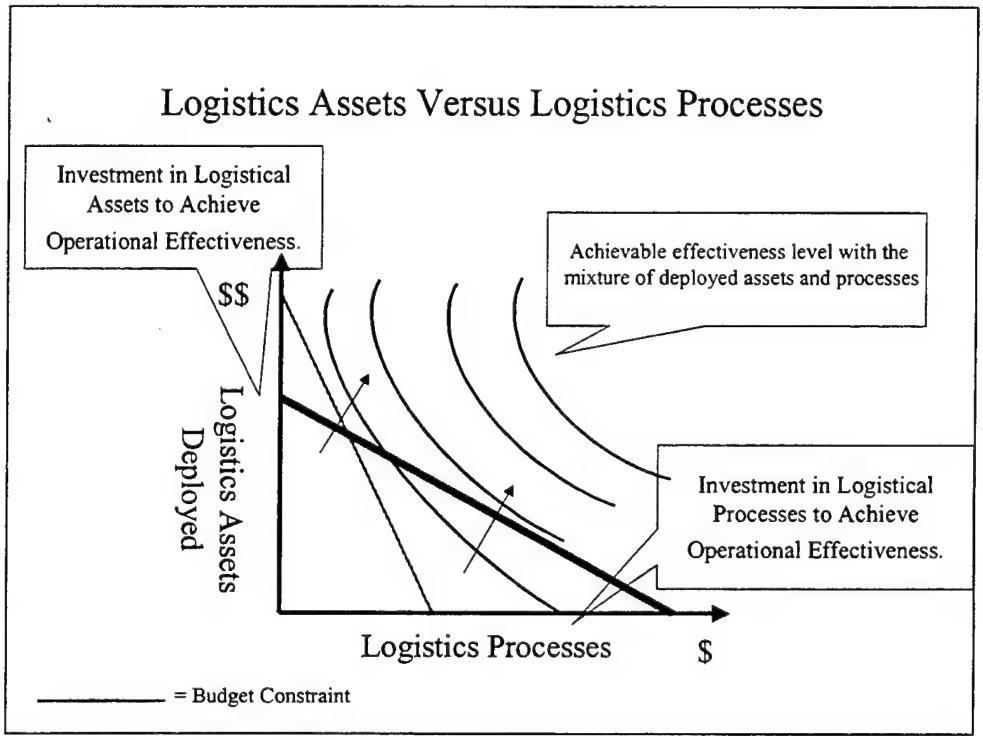

Figure 23. Logistics Assets Versus Logistics Processes

The two straight lines in the figure cost the same amount, but the solid line provides greater return because the process is less expansive than investment in logistical assets.

The quality and efficiencies of the processes can greatly reduce the need for deploying logistical assets. When a need arises in the deployed area, the logistical system is able to response quickly to meet the demand in the deployed area. If proper planning

has been conducted before the deployment, the need for logistics meets with the most efficient solution either in obtaining supplies in the deployed area or re-supplying from the most efficient logistics provider. This is in accordance with the agile logistics concept; however, as shown in Figure 19, logistics influences the ability to meet the operational requirements and, therefore, emphasizes how to develop a responsive system capable of meeting the operational requirements.

1. The Law of Diminishing Marginal Return of Investment In Processes

In the last decade, as described in Chapter III, the USAF has invested heavily in developments of information systems. These developments are expected to increase the efficiencies of the logistical processes so that the USAF can achieve the goal of reducing logistics footprint during deployment. However, the RNoAF still encounters challenges in developing the right mixture of information systems and logistical assets to achieve the goal of operational effectiveness during deployments. The law of marginal returns on investment is applicable to military investment either as spare parts or an information system. As shown in Figure 24 a certain amount of investment contributes to an increase in the level of effectiveness; however, at the point of N in the figure, the effect of further investment will be marginal and the investment could be spent more effectively on other aspect of the logistics support to improve the overall effectiveness. This methodology can be applied to all the trade off studies of logistics. The challenge is to maximize the effect of the investment, which contributes to the required level of effectiveness in the most efficient way.

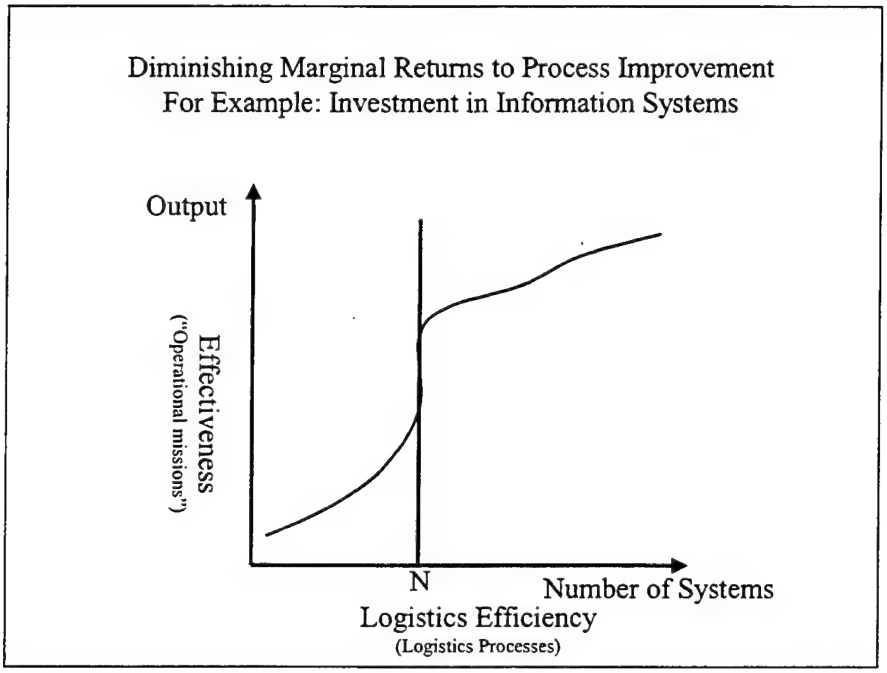

Figure 24. Diminishing Marginal Return on Investment

Cost is an important factor in planning; however, for the design of logistics effectiveness, this has to be balanced with requirements to meet the war fighters' need. Some assets might have to be deployed because they are critical to the operational effectiveness, whereas other assets can be stocked at central or regional warehouses. The solution, would be determined in the integrated planning process that takes place in accordance with Figure 3 in Chapter III. In military business all solutions might not be cost effective, but they will contribute to the goal to achieve the best relationship between logistics and operational accomplishment. This challenge is similar for the RNoAF and the USAF; however, given the size and number of command levels, the RNoAF is in a better position than the USAF to get the integrated process flowing. As shown in Chapter III the RNoAF do not has all the different echelons of command level that are involved in

the planning. If the RNoAF develops a strategy on the importance of how to reach the goal, they are in a favorable position of to streamlining the logistics system to be more efficient in meeting the operational requirements. If not, the logistics processes can result in inefficient logistical systems that badly affect the deployed forces as well as the forces operating at home.

D. WHAT CAN THE RNOAF LEARN FROM THE USAF

The EAF concepts show that the USAF has taken further steps in designing the whole Air Force to meet future deployment contingencies. The agile logistics concept is the overarching framework for the logistical changes that are going to take place. This concept is applicable to those challenges encountering by the RNoAF in the transformation of deploying squadrons for international operations. The RNoAF cannot afford to bring masses of logistics and personnel for deployment. The deployment to Italy in 1997, as part of Operation Allied Force, showed that the amount of logistics support brought by the squadron negatively influenced the capabilities of conducting the operational training and missions for the squadron in Norway. In order to support a deployment efficiently, the RNoAF has to research and investigate the right combination of efficient logistics processes and investment in logistics assets in order to meet both the domestic and international operational requirements.

1. Logistics Organization

The RNoAF has a much flatter organization, compared to the USAF, which should help the deploying squadron to communicate needs and requirements up through the organization. It is important that the organization's leadership develop a set of guidelines directing them in achieving their desired logistics support. If the goal is to maintain a flexible, responsive and deployable logistics organization, it requires the whole organization being designed to support the goals. In this sense, organization means structure, systems and tools available to support and conduct deployment.

The static organization from the Cold War cannot support the requirements of a flexible and responsive organization. The wing and squadron organization in the USAF have all dedicated people in their organization for deployment, which means they operate together on a daily basis. The RNoAF has until now relied on mobilizing personnel from different bases to be able to conduct a deployment. This does not support the goal of a flexible and responsive logistical organization. The wing and squadron has been divided into many different functions that require coordination. The RNoAF has an advantage since, due to is size, that its personnel are expected to cover more functions and therefore coordination and communication do not need to involve the amount of people that seem to be necessary for the American squadrons. This disadvantage of limited personnel dedicated for deployment in the organization, creates more of a spin up time before the squadron is properly trained and ready for deployment.

2. Logistical Tools to Improve Efficiencies

Over the years, the USAF has developed several helpful tools for logistical planners. These tools were developed based on challenges and problems faced by the USAF on numerous deployments. In a sense the tools represent organizational learning which avoids repeating the same mistakes done on previous deployments. Most of those tools should be studied by the RNoAF for possible support of deployment planning in general and during deployments. Some of the tools are of general use, like LOGCAT and TPFDD, which can be applied to all services. Other tools are more directed toward a particular use by air forces, covering several aspects of the logistical planning. Today, the RNoAF has only IMAS, a material and administration system. That does not cover all the challenges of logistics for deployment. The plan is to develop more modules in IMAS so that it will also cover logistics for deployment; however, the RNoAF would be better off investigating some of the modules that are already developed, for example those in the USAF.

Logistics efficiencies have to be achieved by combining and balancing all the logistical factors. All factors are interrelated and trade-off studies identifying a balance have to be conducted. Several research studies have been done by Project Air Force of RAND on the behalf of the USAF to investigate the possibility of rapid deployment with necessary logistics to meet the operational requirements. In the research study *A Concept for Evolving the Agile Combat Support/Mobility System of the Future* (Tripp, 2000), the study discuss how to balance the different logistical factors so that the operational requirements can be met, and at the same time be responsive. The conclusion is that trade

offs have to be made in both organizational structure, logistical assets and the actual deployment scheduling. The USAF has a much broader geographical area where missions are to be carried out; nevertheless, the logistical trade offs are the same in the RNoAF. However, given the size and logistics assets the trade off done in USAF is expected to relay more on logistical assets than what seems to be the case for the RNoAF. This is illustrated in the figure below.

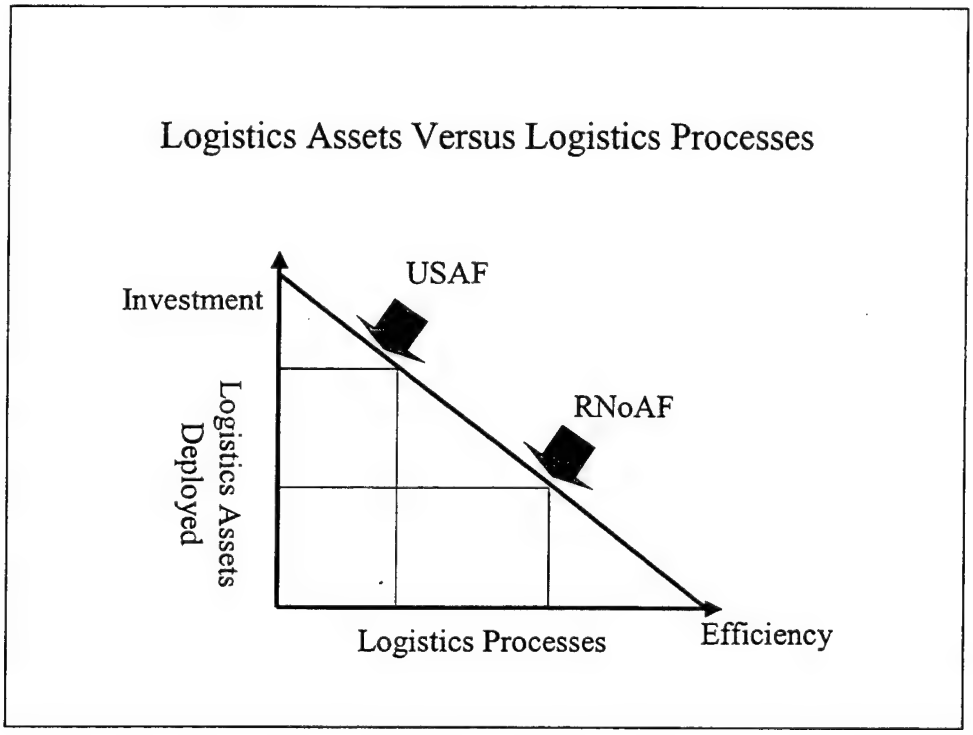

Figure 25. The Conceptual Balance of Logistics Assets and Logistics Process

Figure 25 shows that the USAF has necessary resources and organization to invest in logistics assets like structure, system, spare parts and equipment to compensate for the cost of logistics efficiencies. The RNoAF is not in a situation where investment in logistics assets can be exchanged to the cost of inefficient processes. Based on this the RNoAF has to invest resources to develop an efficient system to support deployment so

available assets are used optimally. This concludes that the RNoAF needs to develop reliable and efficient support solutions for deploying forces.

3. Logistics During Deployment

The results of the quality of logistical planning is visible when deployments are carried out. For a organization like the RNoAF it makes sense to develop flexible and responsive systems that respond to the need of the deployed war fighters, instead of investing in logistics assets. If the systems are designed for flexibility and responsiveness they will reduce the need for deployable assets, which then can be used more efficiently, for example, among the squadrons in Norway. When assets are required in the deployed area, the systems need to be efficient and reliable so the deployed squadron can trust the system. Efforts that are now being carried out in the USAF are projects like Total Asset Visibility (TAV) and Radio Frequency Identification technology (RF) to make the re-supply process and, management of the deployed assets more reliable. If those technologies are applied, reducing the amount of deployed assets is a possibility.

E. THE KEY TO ACHIEVE LOGISTICS EFFICIENCIES

The RNoAF can save time and improve logistics efficiencies by adapting and implementing the already developed tools as described in Chapter III. A goal is to increase the efficiencies and still be able to maintain the operational requirements. This will require more integrated planning, than what seems to have been performed in the past. The USAF organizational structure makes this integrated planning more difficult,

due to the number of levels and personnel involved in the planning process. Another aspect that makes it difficult is that most functions, compared to the RNoAF organization, are very specialized. The personnel perform their function very well; however, it is difficult to see how their individual function interrelated with the other planning tasks. This is illustrated in Chapter III, where logistical planning at the wing level is described. The logistics planning functions are divided into the different squadrons and flights. Illustrating that something has to be done with the structure and system to achieve the goals of a more efficient logistics support in the future agile logistics concept.

The situation is somewhat different for the RNoAF, due to available resources and in which manner the planning is conducted. The RNoAF does not have the number of planning levels that the USAF has nor does the RNoAF have the available number of planning tools. To compensate for that, the communication between the RNoAF MC and the deploying squadron must be linked together. The organizational structure has promoted communication and discussion with the involved personnel; however, given its uniqueness and the new task, much of the effort has been conducted on a trial and error basis. Lack of expertise in this sort of operation has hindered the effective and efficient use of the logistical assets. However, given the resources that the RNoAF has available, more emphasis has been placed on developing flexible and responsive logistics systems, since this provides the same level of operational capability with less cost. It is important to state, that the RNoAF is still developing the logistics concept and, therefore, much can be learned from other forces like the USAF to improve the efficiencies of the system.

V. CONCLUSION AND RECOMMENDATIONS

A. CONCLUSION

The RNoAF and the USAF are both encountering great challenges in transforming their logistical concept into the scenarios of the 21st century. The USAF has met the operational requirements in the past by deploying masses of logistics resources, but changes are taking place to adapt to the agile logistics concept. By successfully implementing the agile logistics concept, the focus in the organization is on developing efficient logistics processes and reducing the logistics assets deployed.

The RNoAF encounters the challenge of maximizing its use of limited resources to support both deployed forces and maintaining the readiness of the forces operating in Norway. The comparison of the two concepts shows that the RNoAF can benefit by adapting some of the tools uses by the USAF in planning and deploying squadrons for deployment operations. As shown in Chapter III, the USAF has developed several helpful tools to assist logistical personnel in the planning process. The whole planning process is more or less formalized and computerized and based on centralized databases developed in the USAF organization. The USAF has incorporated its organizational learning in the tools that are used for planning. In the case of the RNoAF, it is more beneficial to adapt some of the tools that are already applicable to the RNoAF environment, instead of developing similar tools by itself.

A successful deployment relies on how well the planning process has been integrated before a deployment. By integrating logistics and operational planning, the

results are units that are able to maximize operational and logistical effectiveness with the least logistical cost. Logistical solutions have to be balanced during the whole planning phase and supported by responsive systems and organizations directed to support deployed operations. To achieve the goal of an effective and efficient organization, it is recommended that the RNoAF move in the direction of a deployable squadron with assigned personnel who train and exercise as part of the squadron, instead of attaching personnel right before a deployment is carried out. This reduces the spin-up time for the squadron, similar to the way the USAF has organized its deployable squadrons.

The RNoAF has an advantage over the USAF, when it comes to the number of command echelons. To maximize this advantage, the RNoAF should develop its communication flow between the planning levels. Compared to the American organization, the RNoAF can, if correctly managed, bring problems effectively up to the level where problem can be addressed immediately.

B. RECOMMENDATIONS

1. The USAF versus the RNoAF Organization

The RNoAF should maintain the organizational flexibility and communication between the deploying units and the RNoAF MC. The RNoAF is in a position where the number of command echelons can, and should, be kept at a minimum in order to achieve logistic efficiency. This aspect is also important to maintain when the new Norwegian Armed Forces Logistics Organization (FLO) is established. If there are too many

agencies and command echelons involved in the planning it will reduce the efficiencies. Experiences from the USAF showed that if to many levels are involved, logistics efficiency decreases and investment in logistics assets increases in order to meet the operational requirements.

2. Forces Operating at Home Versus Deployed

The RNoAF is confronted with the challenge of balancing support to the deployed forces without affecting the forces remaining in Norway. Logistics is critical to the deployed forces, and based on the experiences from the USAF, there are developed information systems that can improve the logistics efficiency in the planning, deploying and sustaining phases of a deployment. The RNoAF should investigate the systems that are available and research how those systems affect the requirements of logistical assets for future deployments. If more reliable systems are incorporated in the planning of deployments, logistical assets can be used more economically and efficiently to the benefit of the forces in Norway and those that are deployed.

3. Centralized Planning

All of the U.S. armed services benefit from collecting other squadrons experiences and lessons learned into a central data base (JULLS -Joint Universal Lessons Learned System). Based on the gathered data, they develop or modify the logistical allowance list and organized logistics support. The RNoAF should formalize more of the

planning process by identifying how data and experiences are gathered and how those experiences are implemented in the planning and conducting of future deployments. This could be done by incorporating a lessons learned database, such as that of the USAF. Nevertheless, it is important to balance how much of the logistical planning should be centralized. A successful integrated planning process requires continuous communication between the RNoAF MC and the deploying squadron.

4. Operational Effectiveness and Logistics Efficiencies

The Agile Logistics concept demonstrated how the USAF will maintain the operational effectiveness by reducing the logistics footprint by 50 percent. Chapter IV , however, showed that there are different decisions that can lead to the same goal. For the RNoAF it is recommended to determine the appropriate factors contributing to efficient logistics that support deployments and to question how the logistics process could be improved in order to maintain the operational effectiveness. The analysis in Chapter III and IV showed that it is less expensive to improve the logistical processes than investing in logistics assets.

The right level is a combination of different factors. The goal is to balance the use of resources with organizational processes. The RNoAF needs to analyze the effect of investment on logistic assets versus process improvement by implementing information systems like those available in the USAF.

C. SUGGESTED FURTHER STUDIES

There are several aspects of the challenges of deploying squadrons to operations abroad that are not covered in this thesis. One important topic for the RNoAF in the future, is the multinational aspect of logistics support. How can the RNoAF improve its logistics efficiencies by cooperating more closely with other NATO countries with the same weapons systems. This is also in accordance with the NATO logistics principle of collective responsibility.

It is suggested that further studies be conducted to quantify the trade between investment in logistics assets versus improved processes. These are important studies to be conducted for the new RNoAF in order to be effective and efficient in the 21st century.

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APPENDIX A. DEFINITIONS

Logistics defined:

There are many definitions of logistics and each places a different emphasis on the relationship of strategy, tactics, movement and production. In NATO, however, the agreed definition of logistics reads as follows (NATO Logistics Handbook, 1998) :

Logistics:

The science of planning and carrying out the movement and maintenance of forces. In its most comprehensive sense, the aspects of military operations which deal with

- design and development, acquisition, storage, transport, distribution, maintenance, evacuation and disposition of material;
- transport of personnel;
- acquisition or construction, maintenance, operation and disposition of facilities;
- acquisition or furnishing of services; and
- medical and health service support.

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APPENDIX B. LIST OF ACRONYMS

ACC	Air Combat Command
ACS	Agile Combat Support
ADAMS	Allied Deployment and Movement System
AEF	Aerospace Expeditionary Forces
AF	Air Force
AFB	Air Force Base
AFDD	Air Force Doctrine Document
AFI	Air Force Instructions
AFM	Air Force Manuals
AFMC	Air Force Material Command
AFSPC	Air Force Space Command
ALP-13	Air Logistics Publication
AOR	Area of Responsibility
BCAT	Beddown Capability Assessment Tool
BSP	Base Support Planning
CONUS	Continental United States
CHOD	Chief of Defense
CMOS	Cargo Movement Operating System
CSAF	Chief of Staff of the Air Force
DCC	Deployment Coordination Center
DMAS	Dynametric Analysis System
DoD	Department of Defense
DOK	Document
DSC	Deployment Support Center
DSOE	Deployment Schedule of Events
EAF	Expeditionary Air Force
HNS	Host Nation Support
HQ	Headquarters
IDS	Integrated Deployment System
IMAS	Integrated Material and Administration System
IOK	International Operations KIT
IRF	Immediate Reaction Forces
LGL	Logistics Supply Squadron
LGS	Logistics Support Squadron
LIMFAC	Limited Factors
LOGAID	Logistics Analysis to Improve Deployability
LOGCAT	Logistics Contingency Assessment Tool
LOGDET	Logistics Detail
LOGFOR	Logistics Force Packaging System
LOGMOD	Logistics Module
MAJCOM	Major Command

NAF	Numbered Air Forces
NATO	North Atlantic Treaty Organization
NDP	Naval Doctrine Publication
NGO	Non Governmental Organization
NSN	NATO Stock Numnber
OPLAN	Operational Plan
PACAF	Pacific Command
PSO	Peace Support Operations
RNoAF	Royal Norwegian Air Force
RRF	Rapid Reaction Forces
RSC	Regional Supply Center
SNLC	Senior NATO Logisticians' Conference
TAV	Total Asset Visibility
TPFDD	Time Phased Force and Deployment Data
UN	United Nations
USA	United States of America
USAF	United States Air Force
USN	United States Navy
UTC	Unit Type Codes
WRM	War Reserve Material

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